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THE PLANTER--SELECTION, ADJUSTMENT, MAINTENANCE, AND USE.
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# THE PLANTER — SELECTION, ADJUSTMENT, MAINTENANCE, AND USE

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1. What Should I Consider When Selecting a Planter?
2. How Can I Understand the Operation of a Planter?
3. What Is the Proper Way to Adjust a Planter?
4. How Should I Use a Planter?
5. How Should I Maintain a Planter?
6. What Are Some Practical Applications?

May-67

Compared to the plow, the planter is a recent invention. Recorded history indicates that man used simple plows thousands of years before Christ's birth, but the first planter patent in the United States was issued in 1839. The Indians dug a hole for a dead fish and then planted some kernels of corn. They were practicing minimum tillage with starter fertilizer according to the terms that we use today. Planters have had many design improvements since that time.

If we ask a modern farmer what he expects a planter to do for him, he will promptly list some of the following functions: plant the seed accurately at high speed, at uniform depth, and at different row spacings; apply starter fertilizer, herbicides, and insecticides; and plant more than one crop.

The farmer, in turn, must understand how the planter works if it is to perform all of the functions he expects from it. He must know how to adjust and use it properly and safely and how to maintain it if it is to serve him for a long period of time.

The purpose of this unit is to give some general information on the selection, operation, adjustment, use, and maintenance of modern planters. More complete information on each type of planter is provided in the operator's manual for that implement. Study it carefully for your planter. A "Corn Planter Information Sheet" is included at the end of this unit to provide a systematic approach to the understanding of the operation and adjustment of each type of planter. Suggested laboratory exercises are also included to provide additional information in the form of practical experience.

## 1. WHAT SHOULD I CONSIDER WHEN SELECTING A PLANTER?

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A planter is designed primarily to plant accurately so you can get a plant population to match the fertility level and potential moisture level of the soil. There are also additional attachments available for the planter just as additional accessories are available for the modern tractor or automobile. When purchasing a planter, there are several questions that should be answered if the planter is to fit your needs.

### What types of planters are available?

Planters today can be roughly divided into two kinds - drill planters and hill-drop planters.

Drill planters consist of a seed hopper, a metering mechanism, a seed tube to guide the seed to the soil, a furrow opener, and some device for covering the seed (Fig. 1). The design of the hopper and boot of this planter permits the seed to fall directly from the cell of the seed plate to the ground. The spacing of individual seeds is determined by the relation of the seed plate speed to the ground speed. Drill planters are simpler, less expensive, and easier to operate than hill-drop planters.

Hill-drop planters consist of a seed hopper,

Fig. 1. These drill-planter units are mounted on a tool bar. Hill drop planting cannot be done with this planter since the units do not have valves. Drill planting makes a more uniform load on the harvesting equipment.

a metering mechanism, and a valve system to collect the metered kernels and plant them closely grouped in a hill (Fig. 2). They also have a furrow opener and some device for covering the seed. Most hill-drop planters can be made to drill but drill planters cannot be made to hill-drop. Some hill-drop planters can also be used to check corn if a check-row attachment is available.

Check-row planters require valves in the seed tubes and use a wire with evenly spaced knots or buttons to trip the valves to place the seed in uniformly spaced hills in the row (Fig. 3). However, only a very small percentage of

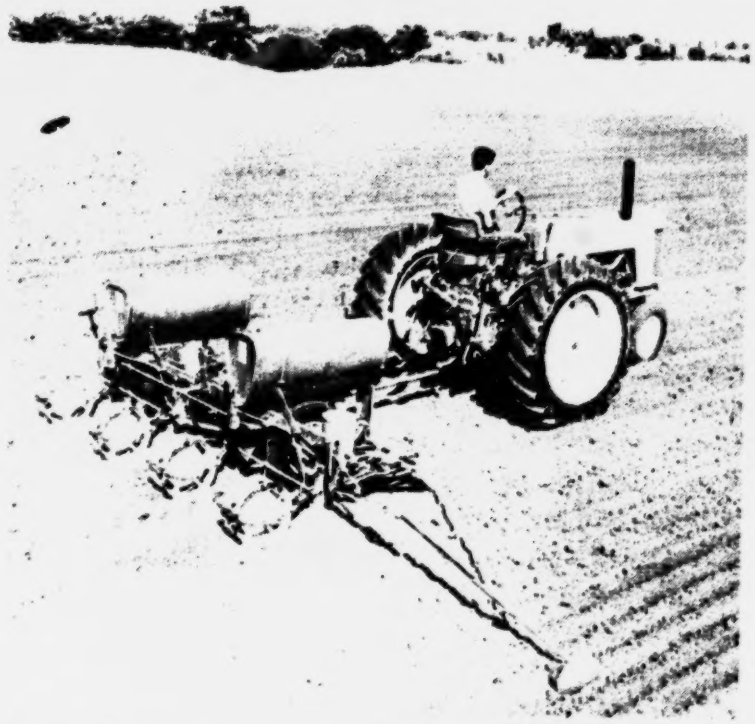


Fig. 2. This planter can hill-drop several kernels in a hill by using a valve mechanism. It can also be changed to drill planting. Some farmers feel that hill-dropped corn will emerge better under crusting conditions and will be less susceptible to wind damage.

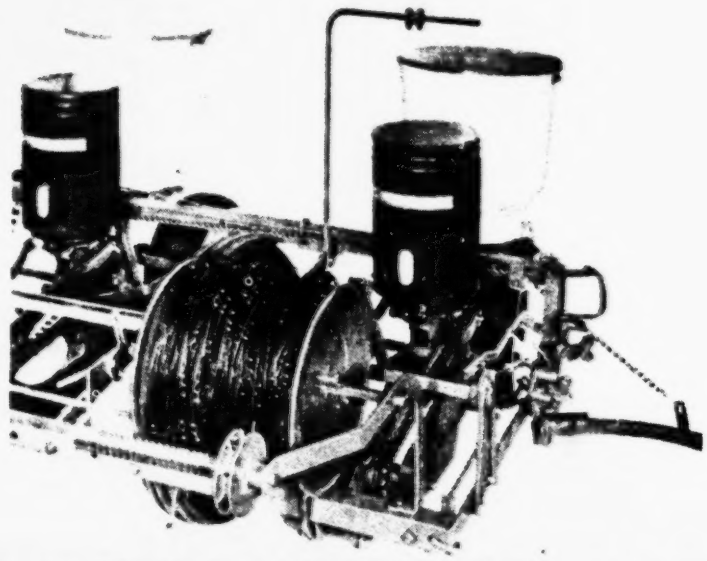


Fig. 3. This planter, equipped with a check-row wire and check attachment, can be used to drill, hill-drop, and check corn.

the corn is checked today. The chief advantage of check planting corn was to permit cross cultivation. Since these planters have such a limited application, the choice for most farmers lies between a drill planter and a hill-drop planter without the check-row attachment.

## What type of mountings are available?

There are several choices of mounting for the planter units:

Trailing planters are independent implements that are towed behind the tractor or behind tillage equipment. They may or may not carry fertilizer attachments or herbicide and insecticide applicators. They can be readily detached from the tractor and easily moved from one field to another or changed from one tractor to another. If field conditions permit, these planters can be ganged together with a squadron hitch for eight- or twelve-row planting at one time (Fig. 4).

Mounted planters may be either rear

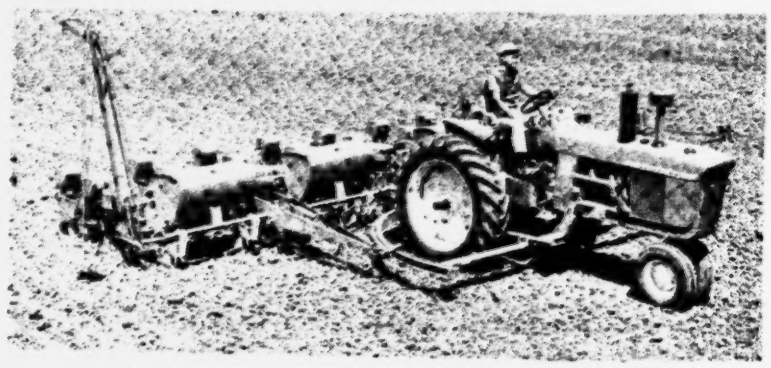


Fig. 4. For large operations, a squadron hitch permits one operator to plant with two four-row planters at one time.

mounted or front mounted. This depends on the type of tool bar used and whether or not the equipment is available from the manufacturer. Mounted planters have several advantages over trailing planters. One is the ease with which the row-spacing can be changed. Another is economy - the individual planter units, purchased separately, usually cost less than a trailing planter. The tool bar may thus be used for tillage, planting, and cultivation. The fertilizer units can be used to apply starter fertilizer at planting time and side-dressed fertilizer at cultivating time. The advantage of this economy must be weighed against some inconvenience and lost time in a busy season. Farmers who plant corn and soybeans may need to cultivate the corn before all of the soybeans are planted. The planter units must be removed and the cultivators installed, then the process reversed again in order to plant, cultivate, and then plant.

Front mounted planters permit good observation of the planting units making it easy to check their operation. Front mounted planters can be used on cultivator bars for four- and six-row planting. The addition of caster wheels on the outer ends of the bars will also permit eight-row planting and cultivating, but these wide sweeping units present problems with flexibility. Many of the bars need reinforcing and there are some problems with folding markers. However, the biggest objection to front-mounted planters is that the tractor is essentially tied up with equipment and it can not be easily detached in order to use the tractor for a day or two for plowing, disking, or harrowing.

Rear mounted planters may also be mounted on a tool bar or a cultivator bar just as front-mounted planters. However, visibility is more difficult with rear mounted units and the additional weight on the back of the tractor may make it necessary to counter balance the planter with fertilizer tanks or weights on the front of the tractor. Most rear-mounted planters can be attached by the three-point hitch or fast-hitch mountings (Fig. 5).

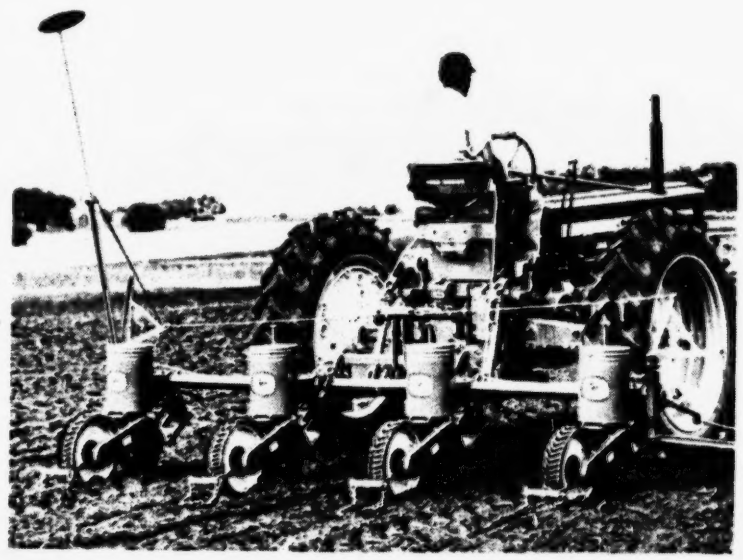


Fig. 5. This planter, consisting of unit planters mounted on a tool bar, can be quickly detached from the three-point hitch of the tractor.

## Size of planter

The size of planter will vary with each farmer's own situation. The spring planting season is usually a hurried one and with large acreages to plant, there is always an urgent need to plant as many acres as possible in a short time. Experimental results indicate an optimum time to plant corn from a yield standpoint. Yields of corn planted on these dates were 15 bushels higher than corn planted two weeks earlier and 31 bushels higher than corn planted two weeks later. The anxiety caused by a late season makes a 6-row or 8-row planter more appealing. However, comparisons of the planting capacity of four- and six-row planters, traveling at the same speed, will show about 30% to 35% increase rather than a 50% increase that might be expected for a 6-row planter over a 4-row. Increased coverage can be secured by using a 2-planter hitch with two 4-row planters. At the present time the choice of trailing planters is between standard two-, four-, and six-row planters, and narrow-row four-, six-, and eight-row planters.

The standard 40-inch row spacing that has survived since the days of farming with horses may soon disappear. Recent experimental results with various row spacings for corn and soybeans indicate definite yield increases for soybeans planted in narrow rows but less consistent increases for corn planted in narrow rows.

Changing equipment, however, to plant, cultivate, and harvest narrow-row crops is a complicated and expensive process (Fig. 6). If corn and soybeans are not planted at the same row widths, there will be considerable time spent changing cultivators and planters to fit the different row widths. Chemical weed control may partially solve this problem. If

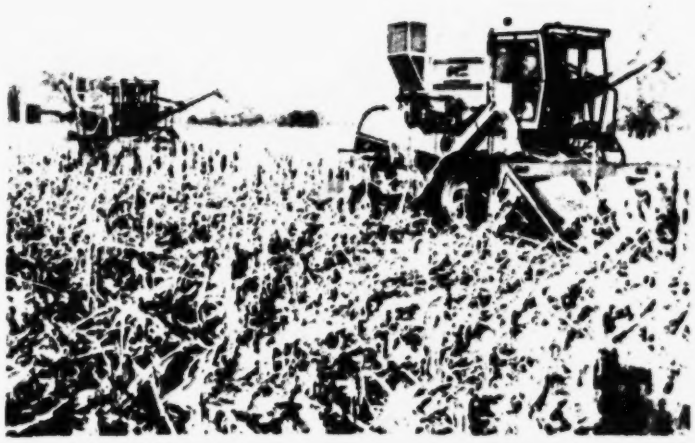


Fig. 6. Changing to narrow rows may require the purchasing of a picker that can accommodate narrow rows or hiring the corn picked by custom pickers as shown here.

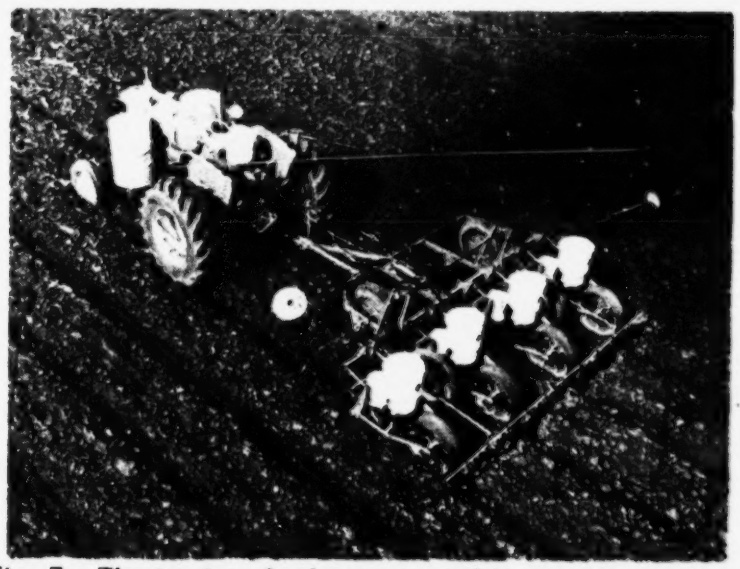


Fig. 7. The tractor wheels are spaced to serve as packer wheels for the first and third rows. Special packer wheels serve to compress the seed zone for the second and fourth rows.

corn is planted in narrow rows, then the conventional pickers or picker attachments for combines will no longer fit and these may also have to be replaced.

Should minimum tillage planting equipment be considered?

There are several benefits associated with minimum tillage planting. (1) There are fewer operations to compact the soil. (2) There is less water runoff and reduced soil erosion because rough loose soil absorbs moisture quickly. This is less important on level fields than on hilly or rolling land. (3) Weed control problems are reduced because the corn can get a head start on the weeds since no seedbed is prepared except in the rows. (4) The number of field operations is reduced so labor and fuel costs are reduced. If you are interested in planting with minimum tillage, there are a number of systems available with planters to fit each system.

Wheel-track planters. Several manufacturers offer wheel-track planters that enable you to plant directly in a plowed field with no other tillage operation. This may be in soil that has been firmed by the tractor wheels or the packer wheels of the hitch (Fig. 7). The soil in the seed row has been firmed and freed of clods and air spaces while the inter-row is left open to catch water and rough enough to reduce weed competition. Some wheel-track planters may be used for conventional planting as well. The tractor wheel widths must usually be modified to match the double-row spacings. Since this system is usually practiced on spring plowing, it tends to concentrate the plowing workload to a short period of time. Fig. 8 shows a wheel-track planter hitch that actually carries the weight of the planter on the packer wheels of the hitch.

Strip tillage can be used with fall or early spring plowing (Fig. 9). A modified cultivator is used as a tillage machine and soil in the row

Fig. 8. The planter wheels are removed and the planter is suspended from the wheel-track planter hitch.

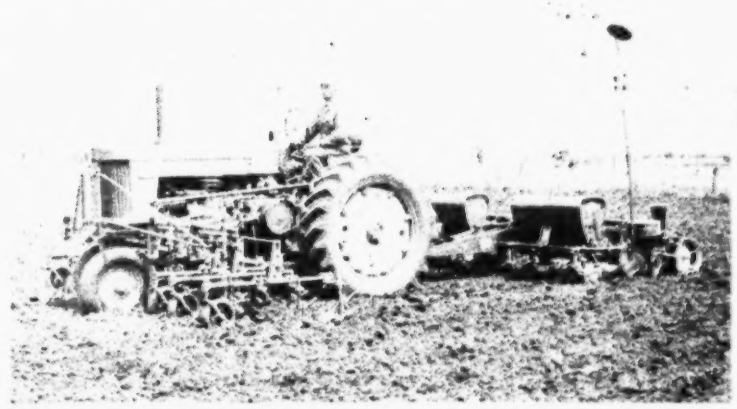


Fig. 9. This farmer has combined a row-crop cultivator with a corn planter to save tillage operations in a spring-plowed field.

is leveled by the rotary-hoe tines (Fig. 10). These units utilize a conventional pull-type 4-row planter towed behind a tractor equipped with tillage units on the cultivator tool bars. Unit planters mounted on a tool bar may be used instead of the trailing planter. Present cultivating equipment can be utilized with this system.

Mulch tillage consists of planting directly on soybean stubble or corn ground. The planter is pulled behind a field cultivator, chisel plow, or a mounted tool-bar cultivator (Fig. 11). The planters are usually equipped with spring teeth to push aside clods and mulch a 10-inch wide seedbed in front of each planting unit. Disk coverers will assure positive covering of the seed in rough conditions.

## What type of seeding mechanisms are available?

Accurate planting of seed has more to do with producing maximum yields than any other single mechanical factor connected with growing the crop. If more seed is planted than the soil-fertility level will support, many weak plants and barren stalks will develop. If the seed population is too low, tillage, planting, cultivating, and harvesting time is wasted and the opportunity to get maximum returns from the investment in land and labor is reduced.

A few years ago, we relied on gravity to drop the seed from the level of the seed plate to the soil. As planting speed increased, changes were necessary in valve mechanisms to trap the kernels into clusters for hill-drop planting. At the present time, four types of seeding mechanisms are available.

Double-valve system. The valves have deep, "V"-shaped pockets to eliminate seed bounce and scattering of the hills. An upper valve collects the seed as it drops from the seed plate and a lower valve catches the seed dropped from the upper valve (Fig. 12). On the next opening of the valves, the lower valve ejects the seed rearward to compensate for the forward movement of the planter and the seed in the upper valve drops to the lower valve. These planters should not be operated over six miles per hour. The travel speed depends on the hill spacing desired and seed population desired.

Chain flight and valve. One planter uses the flights of a chain to carry the kernels to the lower valve (Fig. 13). This gives positive control of the seeds and virtually eliminates problems of seed bounce.

Drill planters have an open tube that allows the seeds to fall by gravity to the furrow.

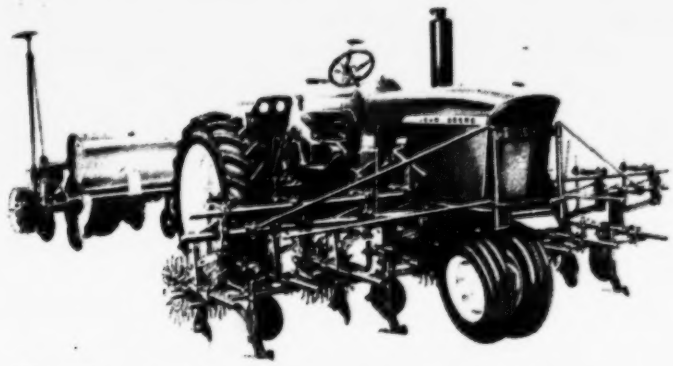


Fig. 10. These tillage units use a sweep, disk hillers, and rotary-hoe wheels to prepare a strip for planting with a conventional planter.

Fig. 11. The planter, equipped with a tillage attachment to mulch a 10-inch seed bed, is shown behind a field cultivator.

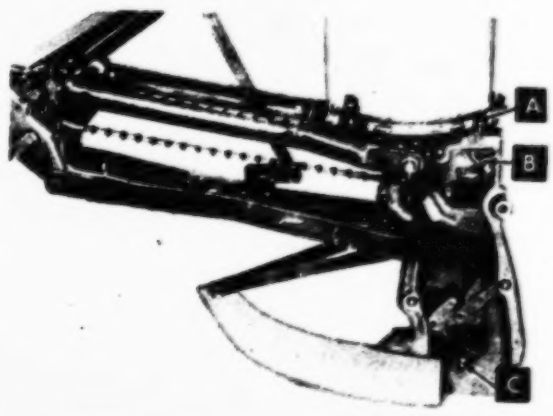



Fig. 12. The seeds drop from seed plate A and are collected in upper valve B. When the valves open, the seeds collected in B are dropped to lower valve C. On the next opening of the valves, the seeds in the lower valve are dropped in the row while the seeds dropped by the upper valve are caught in the lower valve.

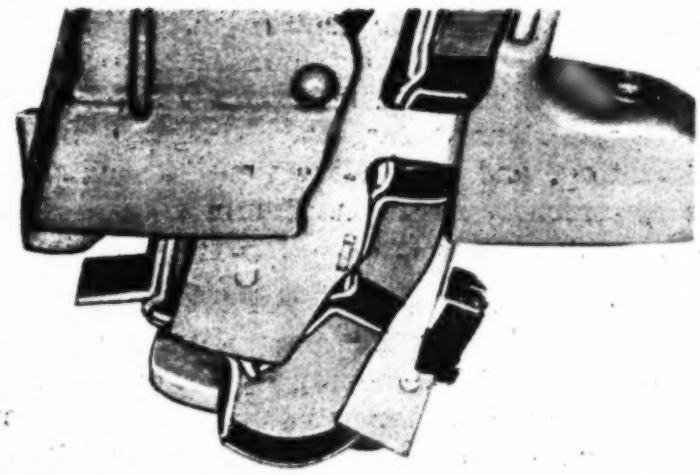


Fig. 13. The flights on the chain carry the kernels from the seed plate to the bottom of the boot where they are deposited in the soil. Each flight of the chain carries the entire hill of seed.

Rotary valves provide a continuous controlled flow of individual kernels or groups of kernels from the hopper to the soil. The cam action of the impeller wheel opens the valve and ejects the kernel or groups of kernels into the furrow to give evenly spaced hills and closely grouped kernels in the hill (Fig. 14).

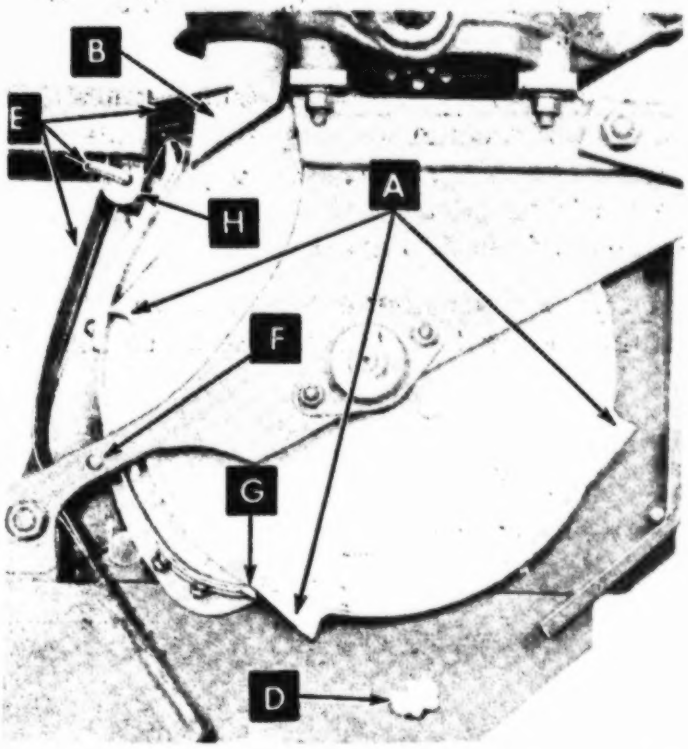



Fig. 14. The ejector lugs A, mounted on the rim of the rotor, catch the kernels discharged through spout B and carry them down where they are closely grouped at G. Kernels that reach point G ahead of the ejector lug are held there to prevent dribbling between the hills. The grouped kernels D are ejected directly into the trench made by the runner opener. The valve can be easily cleaned by removing pin F and cover plate E. Pin H must be in position against the spring to hold the valve in contact with the rotor.

Which fertilizer applicator should be purchased?

The type of fertilizer applicators to purchase should be based on several factors. The kind of service available to the farmer by the fertilizer dealer is perhaps the most important one. Liquid fertilizer is often easier to handle than the dry types because the planter tanks can be pumped full or filled by gravity flow from a supply tank. This advantage must be weighed against a slightly higher cost per pound of plant nutrients in the liquid form. In some areas there is a more limited range of analysis available in liquid fertilizers than in dry. There is no appreciable difference between liquid and dry fertilizer as far as performance, leaching, or danger in handling is concerned.

Liquid fertilizer is metered by gravity flow under a constant head through an orifice in a given period of time so the planter must always travel at the same selected speed. If it travels faster, the application will be lighter than expected. If planting speed is slowed down, the rate of application will be heavier than calibrated.

Dry fertilizer is metered to the distance traveled and variations in speed will have little effect on the rate of application.

Type of seed hoppers

Most manufacturers offer a choice of seed hoppers to the buyer. Large capacity hoppers, holding up to 70 pounds of seed, reduce stops and cut down refill time. Transparent hoppers (Fig. 15) or those equipped with float-type seed gauges give a quick visual

Fig. 15. This planter is equipped with transparent hoppers. Either a transparent hopper or a floating seed gauge gives some indication of the rate at which each unit is planting.

check on the amount of seed in each hopper. This is also an indication that all units are planting seed at the same rate.

Types of seed plates

The selection of the correct seed plates is one of the most important decisions that must be made in the selection of planting equipment. The plates need to be checked every planting season for the grades and varieties used that year to be certain they are properly matched. It is often necessary to select different plates for the same variety of seed from year to year. Single cross seed is becoming more and more popular. This seed has greater irregularities in size and shape than conventional double-cross seed. For single-cross seed proper plate match is doubly important. As planting speed increases so do the chances for inaccurate planting because the plate cells have less time to fill and discharge the seed. Check the instruction book for the correct travel speed for a given plant population.

There are at least three ways to select seed plates. The best method is to select seed plates based on their performance in a test in the barnyard or driveway with the planter operating at the speed at which planting is to be done. Another method is to take a sample of the seed corn and plates to the dealer and check the seed against the plate in a seed-plate selector stand. Be sure the seed-plate tester is operated at a speed that corresponds to the actual seed plate speed when planting. The third and probably least reliable method is to follow the recommendations on the tag of the sack of seed.

Seed plates should be purchased as a full set (four plates for a four-row planter) rather than just replacing a worn or broken one. A set is more likely to give uniform planting rates among the rows. In the past, there has been some justifiable criticism of plastic seed plates but they do have some advantages. They are less expensive and quality control or uniformity among plates is better than with cast-iron plates; plastic plates are less likely to warp; and they are more accurate at high speeds because there is less reduction in cell fill due to increased speed.

Once you are in the field, spot check the planting rate as you change varieties and the corresponding plates. Many fields of corn have been underplanted or overplanted because the operator used the wrong size plates for the grade of corn.

The faster the planter is operated, the faster the seed plate revolves. At faster planting speeds, it may be necessary to use seed plates with slightly longer cell length to obtain proper cell fill for the planting rate desired. With a 24-cell seed plate, there is better cell fill at the same planting speed because the plate revolves slower for the same seed rate. In general it is better to use a 24-cell seed plate for hill-drop or drill planting. The 24-cell plate is the same diameter as the 16-cell plate but has eight more seed cells available for filling at any one time. With this plate, you can normally expect 30% to 40% faster travel speed for a given planting rate.

The addition of a tablespoonful of powdered graphite to each hopper full of seed corn will help improve cell fill.

Many companies provide edge drop (Fig. 16), flat drop (Fig. 17), and hill-drop plates (Fig. 18). Over one-hundred different plates

Fig. 16. An edge-drop plate is used to plant graded seed. With this type plate, one seed stands on edge in each cell. Edge-drop plates take maximum advantage of accurate seed selection.

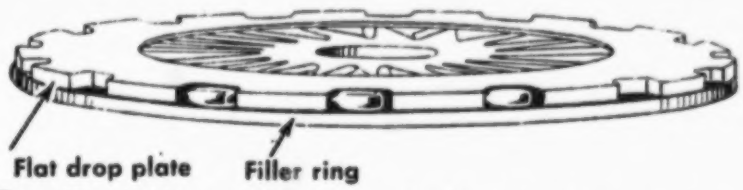



Fig. 17. A filler ring is required with a flat drop plate. It is best suited for flat kernels.

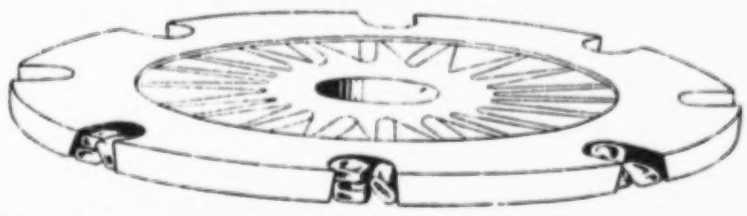


Fig. 18. A hill-drop plate has larger cells, so several seeds are gathered in each to plant an entire hill. These plates are adapted for hill dropping of poorly graded corn, irregularly shaped seed, and hybrid butt and tip kernels.

are available for some planters including plates for round kernels of corn, soybeans, and a variety of other crops.

What other special equipment is available?

In addition to the basic planter, there are accessories that make the planter function more effectively under certain conditions.

Gauge shoes are mounted on the planter runners to give a more uniform planting depth in extremely loose soil. They add flotation to the planter runners. They are adjustable up and down on the runner for deeper or shallower planting (Fig. 19).

Trash kickers are installed on planters that will be operated in fields with small stones or trash. They run directly in front of the planter runners and push aside small stones and trash (Fig. 20).

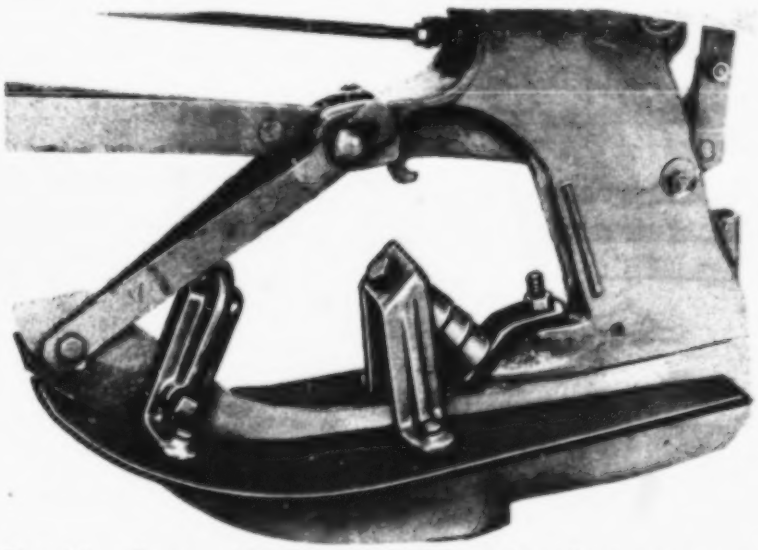


Fig. 19. Gauge shoes are mounted on the planter runners and can be adjusted for different depths.

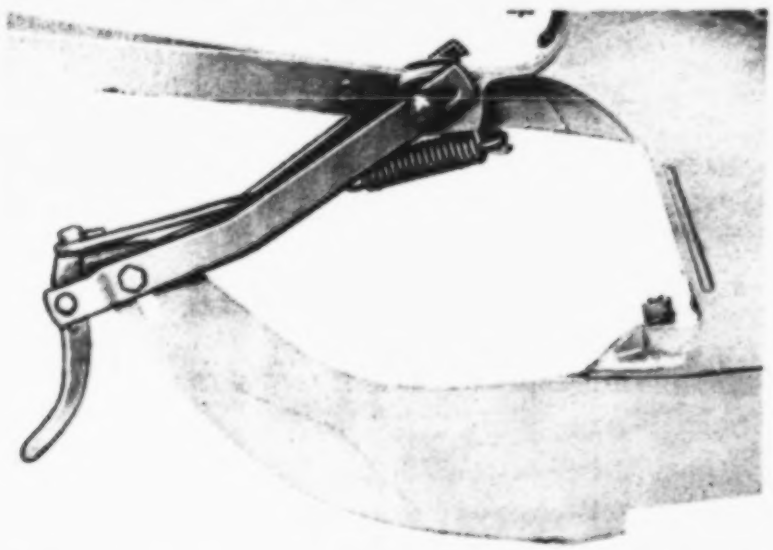


Fig. 20. Trash kickers are mounted on the front of the planter runner.

Multi-luber system or built-in lubricating system consists of a reservoir, pump, and outlets for greasing the planter (Fig. 21).

Press wheel scrapers keep the wheels clean if soil has a tendency to stick to the wheels (Fig. 22). These scrapers are not intended for use with the zero pressure press wheel tires.

Press wheel bands give a more compact seedbed when they are installed between the

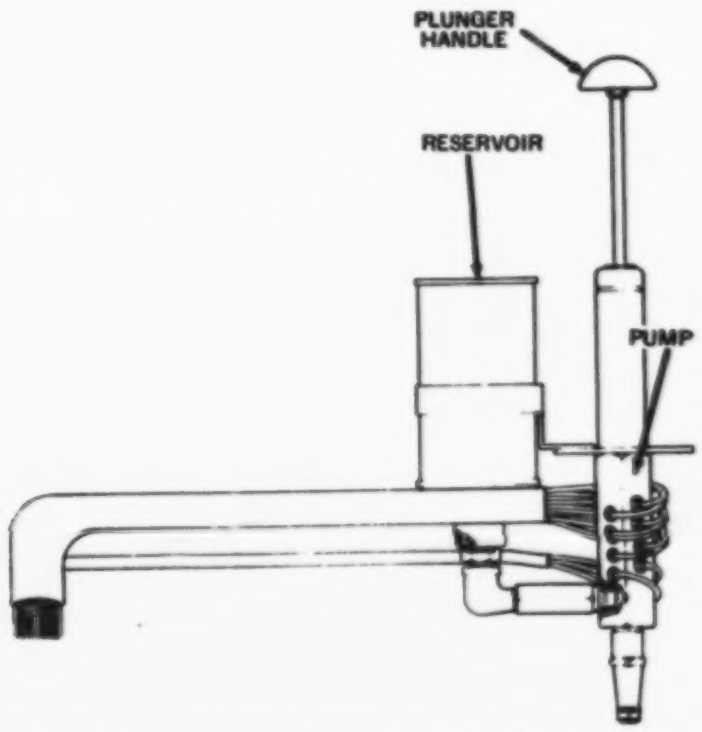



Fig. 21. Multi-luber systems make lubrication of the planter a quick and easy process.

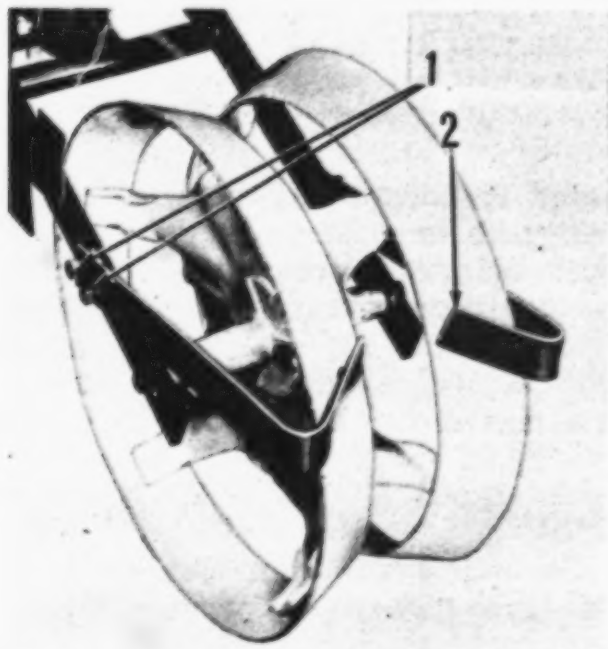



Fig. 22. Press-wheel scrapers clean the press wheels and prevent sticking soil from accumulating. They should be adjusted by the bolts (1) to bear lightly against the wheel (2).

rims of the open centered press wheels (Fig. 23). The overlap joints must be fitted so they prevent the press wheel scrapers from catching in them.

Press wheel tires. Zero pressure tires are designed to fit over the steel press wheels (Fig. 24). The flexing action of the semi-pneumatic rubber tires sheds the soil and keeps the wheels cleaner. No scrapers are used with tires.

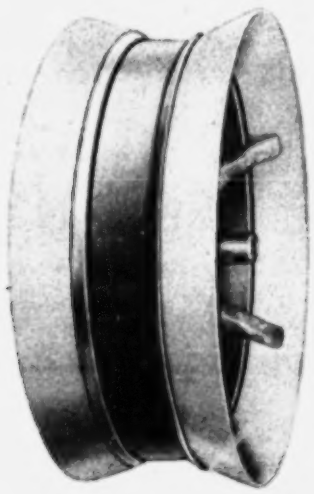


Fig. 23. Press-wheel bands are used to convert open-center press wheels to solid-center wheels.

Fig. 24. Press-wheel tires can be smooth or cleated as shown.

Disc furrowing attachments (Fig. 25) permit uniform planting depth in rough seedbeds. The seed is placed deeper in moist firm soil. The distance from the bottom of the disk blades to the bottom of the runner heel is the depth of planting (Fig. 26). They can be adjusted for various depths.

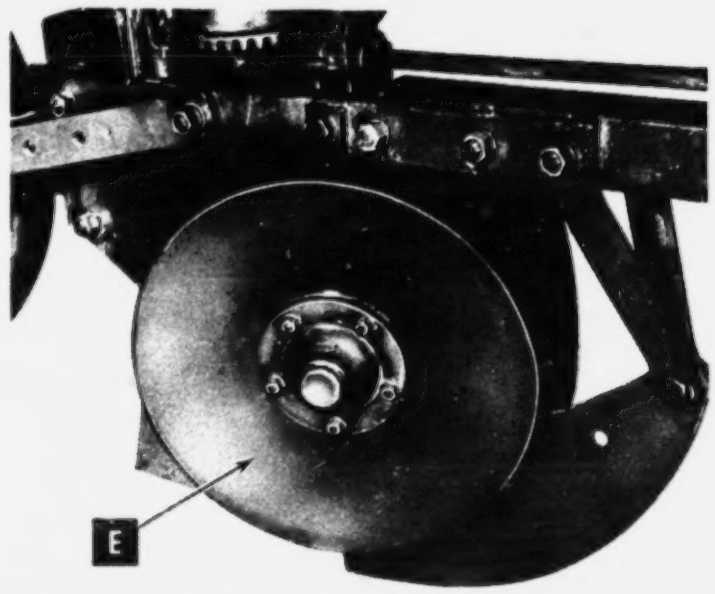



Fig. 25. Disk furrowing attachments E are recommended with minimum tillage planting. They are mounted on both sides of the runners.

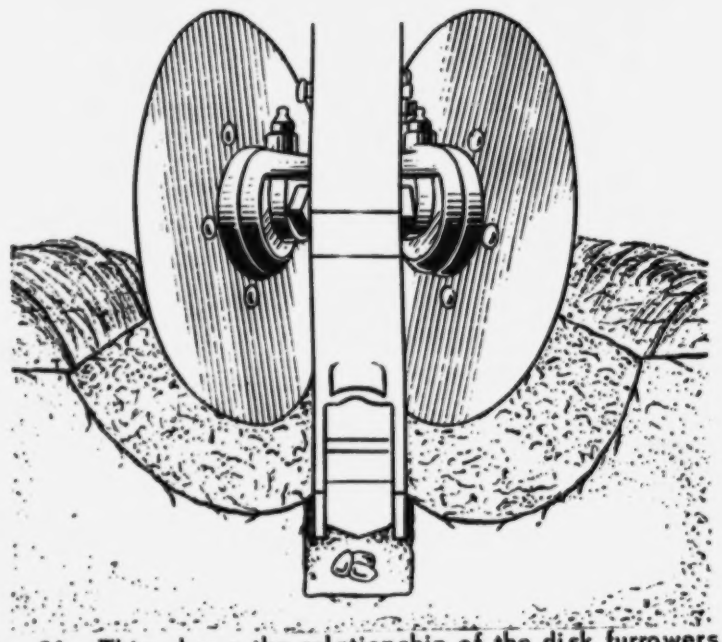
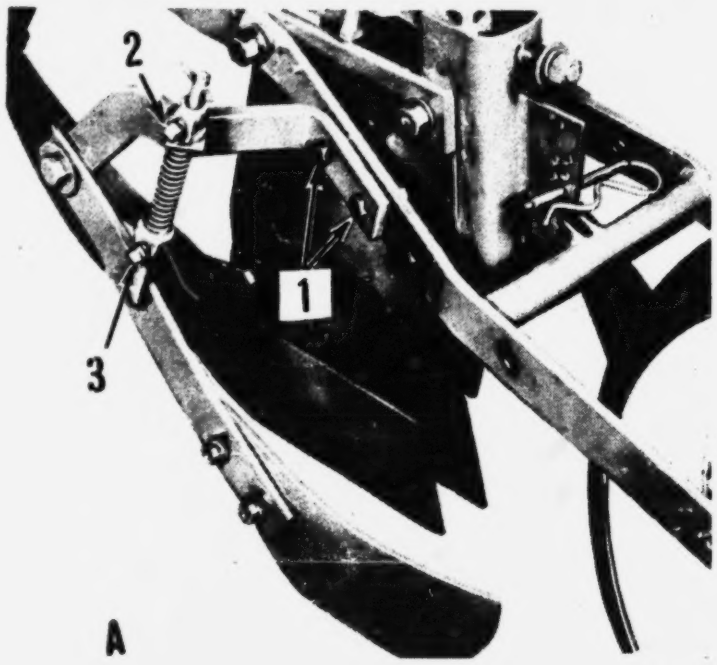


Fig. 26. This shows the relationship of the disk furrowers to the planted seed.

Covering attachments may be of the blade or disk type (Fig. 27). A pair of right and left units may be used with each row unit or one to each row unit if desired.

Seed firming wheels run directly behind the planter runners and press the seed against the moist soil in the bottom of the runner furrows (Fig. 28). If they are operated in moist soil, there may be clogging problems.

Minimum tillage attachment decreases tillage operations prior to planting (Fig. 29). It pushes clods aside, eliminates air pockets, and mulches the soil. It prepares a band of soil approximately 10 inches wide in front of the furrow opener.



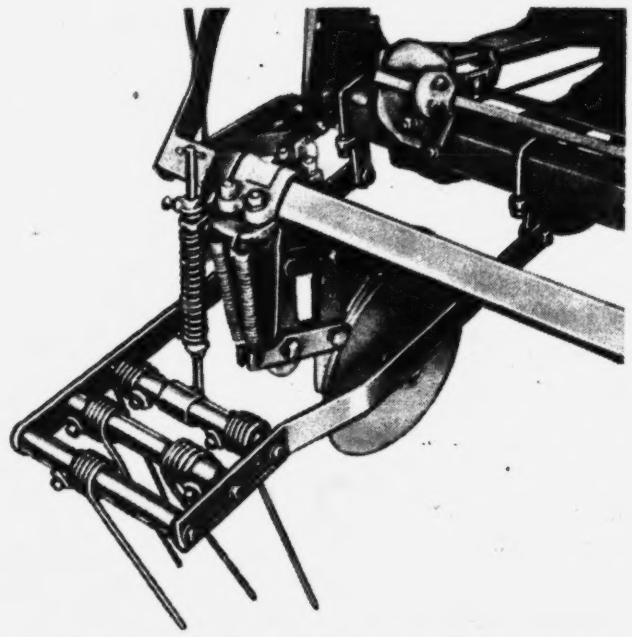



Fig. 29. Minimum tillage attachments are mounted directly in front of the furrow openers.

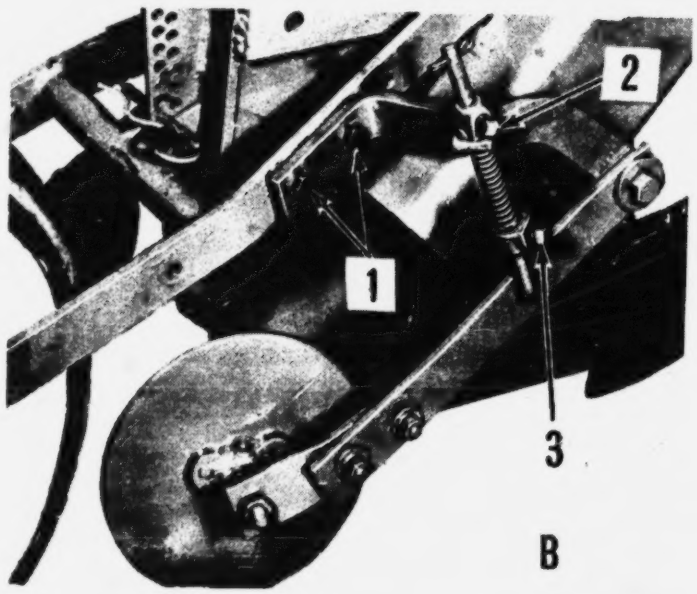



Fig. 27. The blade covering attachment A or the disk covering attachment B is used for more positive covering, especially when planting shallow. 1 shows mounting locations. The depth is adjusted at 2 and the pressure at 3.

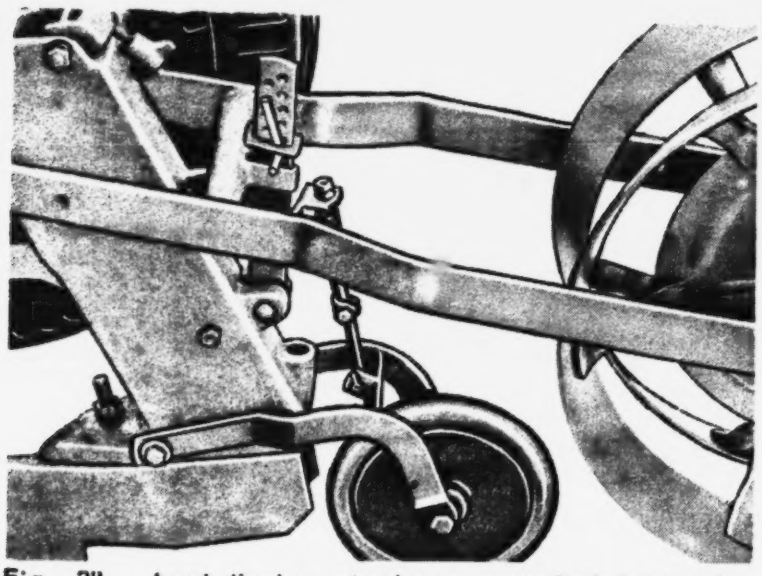


Fig. 28. Seed firming wheels are attached behind the planter runners.

Disk furrow openers are mounted on the front of the runners (Fig. 30).

Disk markers. For rough or trashy fields, disk markers are sometimes preferred instead of regular markers (Fig. 31).

Soil incorporation equipment. An additional accessory that seems to pay dividends under certain conditions is some device for incorporating herbicides and insecticides into

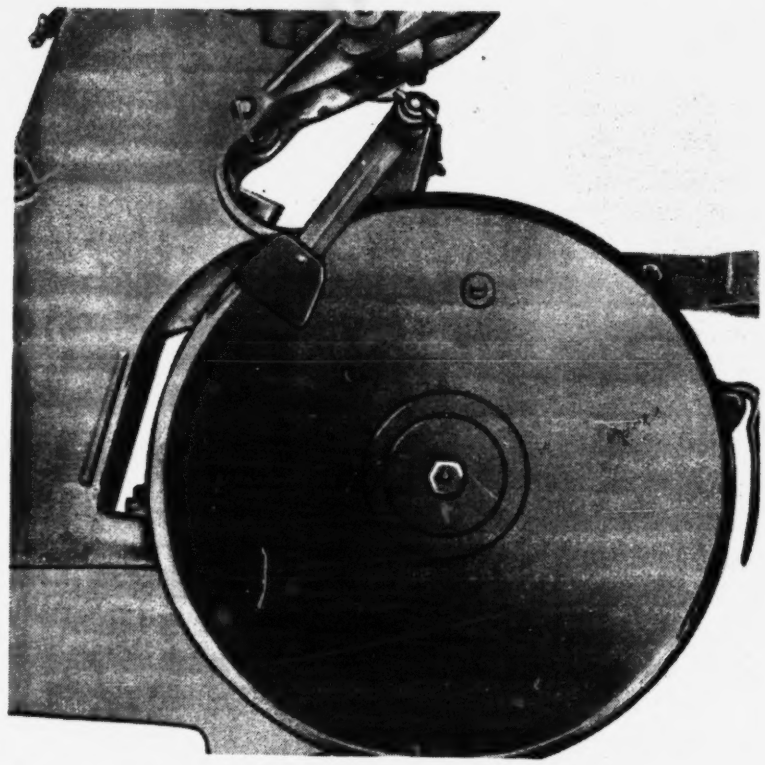


Fig. 30. These openers work well in trashy or stony fields, because the disks cut through or roll over obstructions.

Fig. 31. Disk markers roll over rough soil.

the soil (Fig. 32). Some chemicals are volatile and tend to dissipate when exposed on the surface. Others are susceptible to sunlight and break down if left on the surface. More uniform control is likely if the pesticides are incorporated because chemical activation is accelerated due to placement in moist soil. In dry periods some pesticides never function because they need moisture to become effective. Surface application confines them to dry soil which limits their effectiveness. With soil incorporation equipment the erosion losses are likely to be lower.

There are a number of incorporating devices on the market at the present time. The ground-driven devices are more effective on well prepared soils. They are not likely to be very effective in cloddy or trashy conditions found with minimum tillage planting.

Fig. 32. The perforated roller mixes the herbicide with the soil.

## 2. HOW CAN I UNDERSTAND THE OPERATION OF A PLANTER?

Most farmers want the following operating features in a corn planter: 1) Be as simple to operate as possible and still meet the requirements of a modern planter. 2) Plant accurately at a uniform depth and be easily adjusted to different planting rates and planting depths. 3) Be able to operate for a sustained period at speeds up to 6 or 7 miles per hour. 4) Be easy to change from one crop to another and from drill to hill-drop planting. 5) Have the capacity to plant seed for high plant populations with starter fertilizer without frequent stops for refilling. 6) Have the strength to carry the seed, fertilizer, and pesticides without bending the frame or damaging the planter in other ways.

You must understand how the planter operates if you are to adjust, use, and maintain it properly. The best way to gain this understanding is to carefully study the planter and the operator's manual. It may help to block up the planter and turn the wheels by hand.

### WHAT ARE THE MAJOR PARTS OF A PLANTER?

#### Hitch

The hitch on a trailing planter is usually equipped with some clevis adjustment so the seed plates in the planter can operate level (Fig. 33). If the planter is hitched high, it tends to drag the planting units down and places undue strain on them. Also, the depth of planting may be affected by the height of the planter hitch.

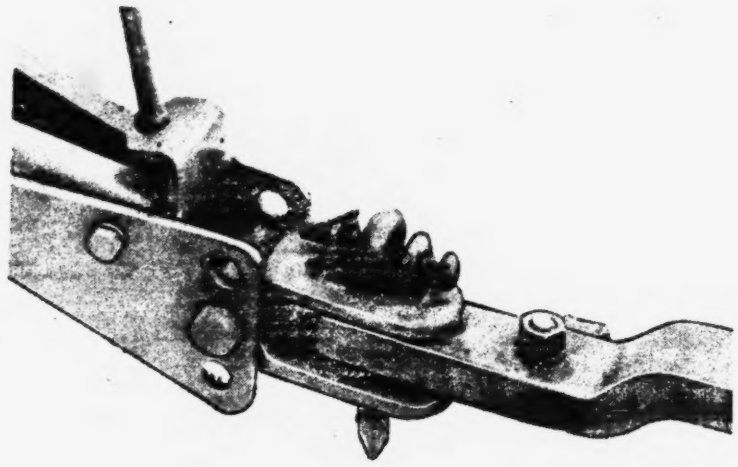


Fig. 33. The adjusting holes for the hitch are shown here.

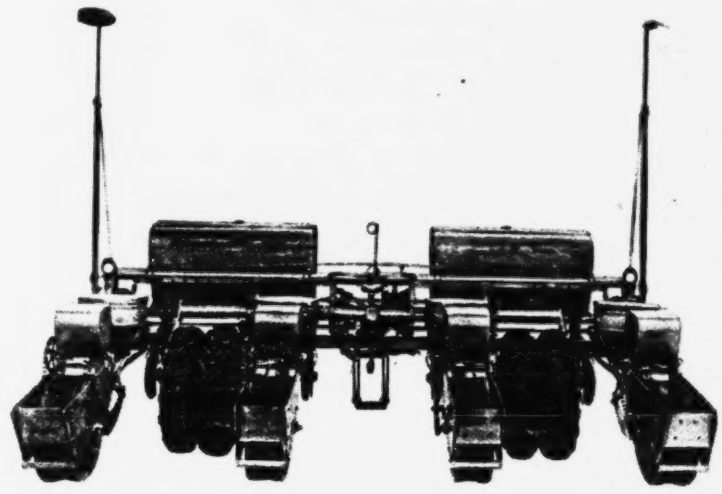


Fig. 35. The dual wheels provide better stability in soil where floatation is a problem.

## Power lift

The power lift on a planter may be a ground drive power lift or a hydraulic lift (Fig. 34).

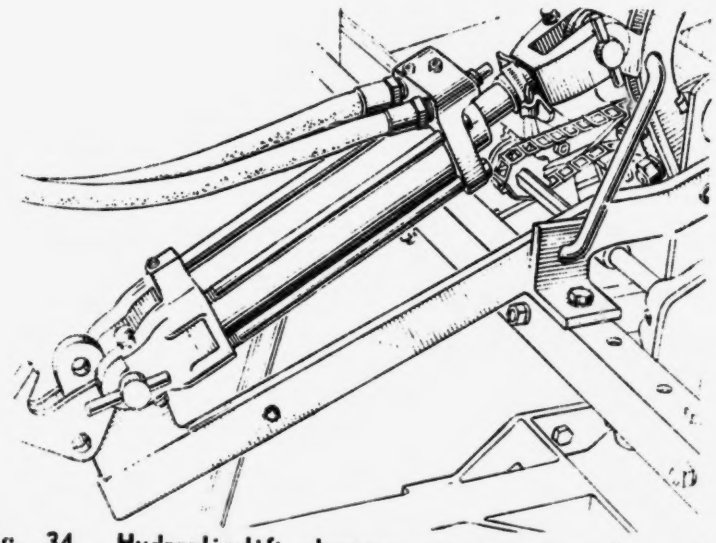


Fig. 34. Hydraulic-lift planters are most prevalent, although ground driven power-lift planters can be purchased.

## Frame

The frame of the planter must be strong enough to carry the load of seed and fertilizer. Some planters have transport wheels welded in place. Others are movable so the planting units may be adjusted to various row spacings from 28 to 40-inch rows. Some planter frames can be equipped with dual wheels for better flotation in soft soil (Fig. 35).

## Planter units

The planter units consist of a frame, boot or valve case, seed hopper, hopper bottom, seed plate, runner, and press wheel (Fig. 36).

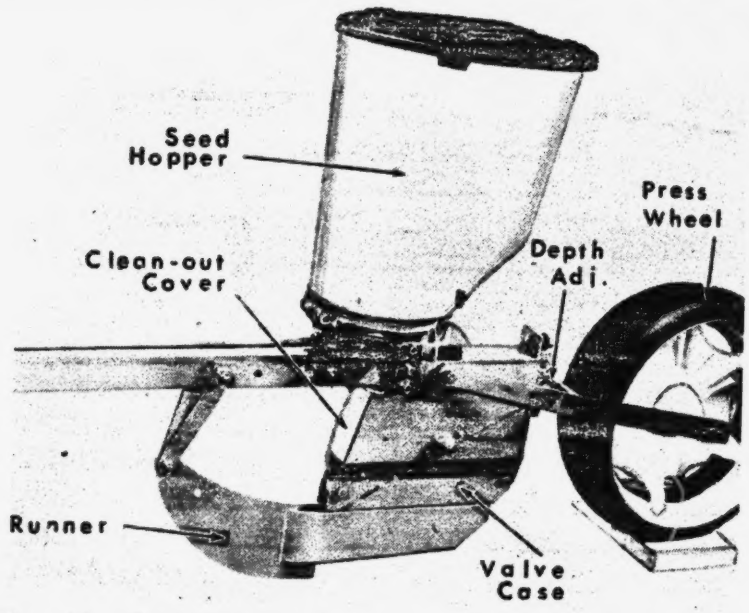



Fig. 36. This illustration shows a row planting unit for a planter.

## WHAT IS THE CORRECT IDENTIFICATION OF ALL PLANTER PARTS?

Study the planter and the operator's manual and learn to identify the parts. Be able to identify such parts as these:

Hitch
Power lift
Transport link
Transport wheels
Main frame
Clutch
Marker
Drive chain
Runner
Pressure rods
Press wheel
Fertilizer hoppers (tanks)
Rotary valve
Ejector lugs
Accumulator plate
Boot
Upper valve
Lower valve
Gear case
Shift lever
Drive sprockets
Drill shaft
Striker

Fertilizer opener
Disk opener
Disk furrower
Insecticide attachment
Herbicide attachment
Seed hopper
Cut-off pawls
Seed plate
Knock-out pawl
Chain flight valve

## HOW DOES THE PLANTING MECHANISM OPERATE?

### Seed metering

The function of the seed metering assembly is to deliver an accurate number of seeds to the boot at the correct rate or at correctly spaced intervals.

### Hopper bottom

The hopper bottom is cone shaped to feed the seed to the cells on the outer edge of the seed plate (Fig. 37). Lowering the planter engages the seed plate drive by the planter wheels. Seeds drop into the cells in the seed plate before the cells pass under a cut-off pawl that prevents more than one seed from entering the planting chamber at a time (Fig. 38). These cut-off pawls should be aggressive enough to prevent more than one seed from entering each cell. The cut-off pawls should not be aggressive enough to crack seeds. Inspect them to see that they operate freely.

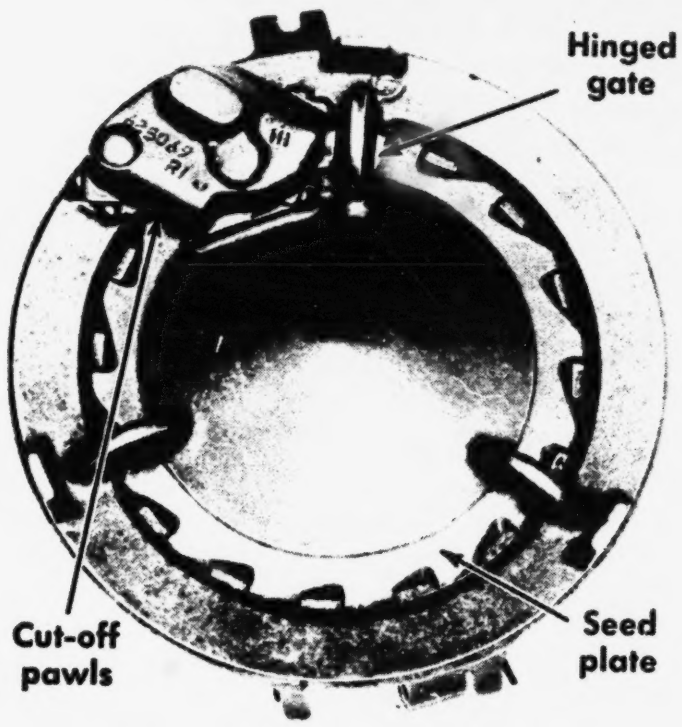



Fig. 37. The conical hopper bottom forces the seed against the seed plate.

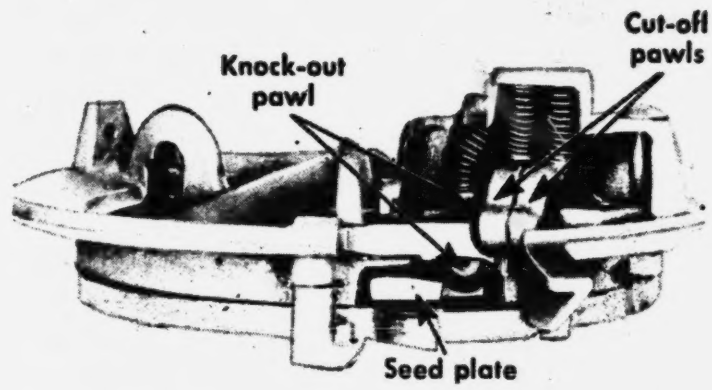



Fig. 38. As the seed plates rotate, the seeds drop into the cells. The cut-off pawls dislodge any seeds caught sideways in the cells. The knock-out pawl helps push the seed out of the cell.

As the cell in the seed plate turns over the hole in the hopper bottom, the seed drops from the cell through the passage. The knock-out pawl assists the seed out of the cell (Fig. 39). The empty cell passes out of the seed chamber under the gate on the rear side of the pawl cap. The gate is free to move up and down which allows loose seed or trash to move out of the chamber back into the seed can. The design of the gate prevents any seeds from entering the seed chamber from the back side.

### Hill-drop planting

Two-stage valve. Some models of planters have an upper valve and a lower valve in the seed tube. The seeds are first held in the upper valve where they are retained in the "V" or upper pocket (Fig. 40). When a hill of two or three or four seeds, according

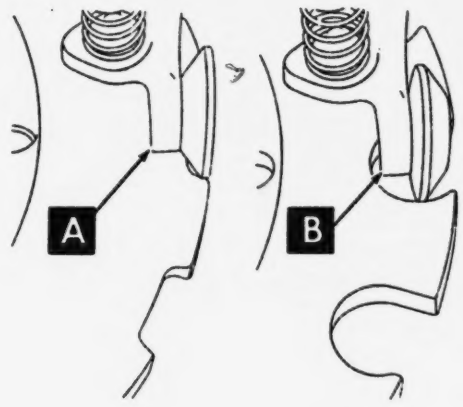



Fig. 39. The roller knock-out pawl may be assembled with the roller rim either toward the edge as in A, or toward the center as in B. Set the roller as in B for deep-cell plates.

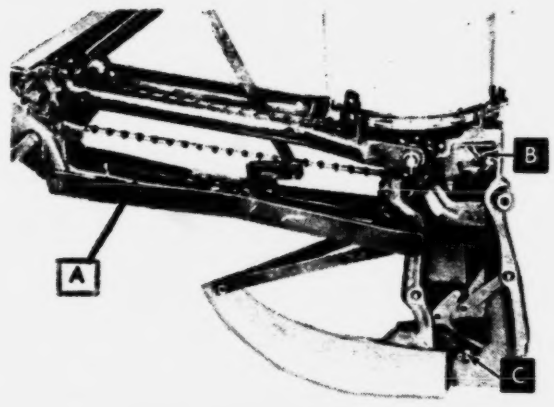



Fig. 40. The seeds that have dropped from the planting chamber through the hole in the hopper bottom plate are retained in upper valve B. The valves are tripped simultaneously by pull rod A. The lower valve C catches the seeds released by upper valve B.

to the position of the selector lever, is collected in the upper valve, the valves are tripped and the seeds drop down the tube to the lower valve. Both valves open and close simultaneously during the cycle of operation. The lower valve closes and catches the seeds released by the upper valve. The rotating seed plate replaces the seeds in the upper valve. When the pull rod opens the valves again, the seeds held by the lower valve are deposited into the furrow prepared by the runner and opener.

Rotary valve. On one rotary-valve planter, the kernels drop from the seed plate to an accumulator plate (Fig. 41). This plate groups the kernels by twos or threes depending whether a 16- or 24-cell seed plate is used. The grouped kernels are dropped together when the opening in the accumulator plate passes over the opening in the hopper bottom plate. The ejector lugs on the rim of the rotary valve catch the seeds and carry them down through the valve and deposit them directly in the furrow made by the runner opener.

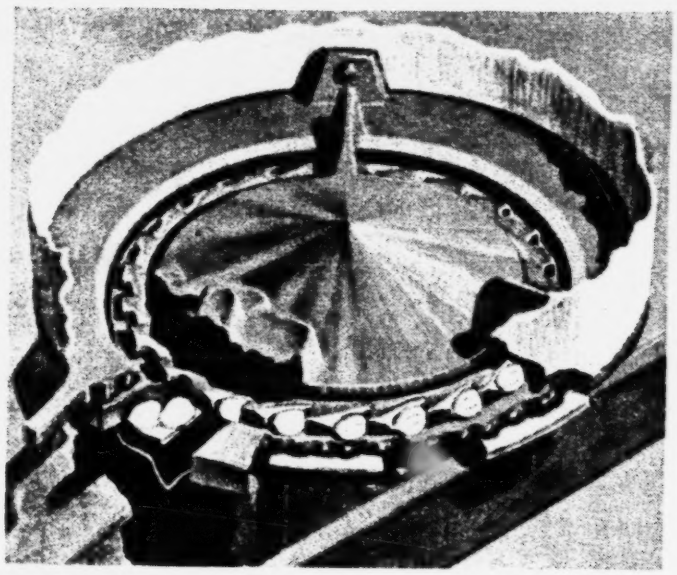


Fig. 41. This accumulator plate has eight large notches cut in the circumference. Two kernels from the seed plate have dropped on the accumulator plate and the third kernel from the seed plate will drop just about the time the notch in the accumulator plate passes over the opening in the seed tube. Thus, the three kernels are dropped in the rotary valve as a group.

Chain-flight valve. On the chain-flight valve planter, the chain runs constantly when the planter is lowered and the drive wheels turn forward. The number of cells in the seed plate and the number of teeth on the valve sprocket regulates the number of kernels per hill. Each flight on the chain contains the entire hill of seed. The lower gate valve must work freely or the kernels will not be spaced evenly. The flights need to be timed to the cells in the plate and to the valve at the bottom of the boot.

## Drilling

Two-stage valve. On the two-stage valve planters, the valves are locked open and the seed falls from the seed plate in the planting chamber through the seed tube to the soil.

Rotary valve. To change some rotary-valve planter models, simply reverse the hoppers and let the seed pass down the seed tube. On other models, you remove the rotary valve, chute, and sprockets and insert a drill tube. For power drilling, one model rotary valve operates as though it were hill-dropping one kernel at a time after the accumulator plate has been removed and two extra lugs bolted on the rotor. Drill planting can be done by removing the accumulator plate, disengaging the rotor valve, and removing the valve-case assembly and replacing it with a drill case (Fig. 42). The rotor must be pinned in place so the lug doesn't interfere with the drill case.

Chain-flight valve. The chain-flight valve planter can be set to plant one kernel per hill by using a 16-cell seed plate which is power drilling. The addition of powdered graphite to the seed corn will lubricate the chain flights. To drill soybeans, maise, or sorghum, the spring holding the arm on the cam should be released. Some operators prefer to remove the entire chain flight unit to plant soybeans.

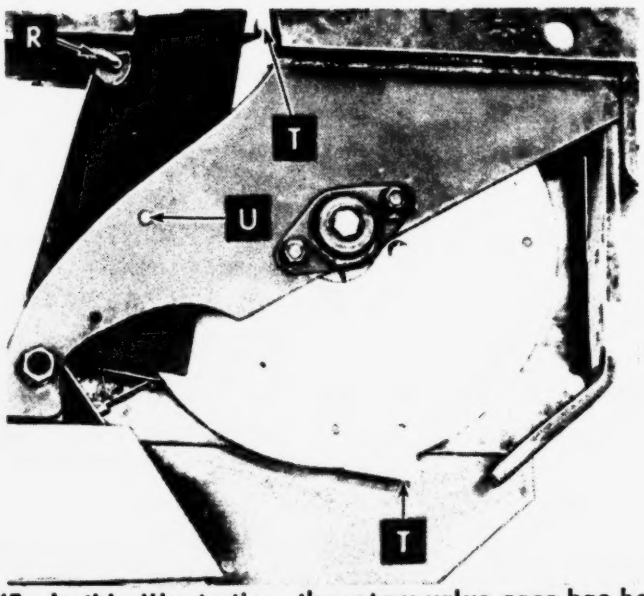



**Fig. 42.** In this illustration, the rotary-valve case has been removed and replaced with a drill case, secured by pin R. The rotor is turned so the lugs T are in the position shown and a pin is inserted at U to lock the rotor.

## HOW DOES YOUR PLANTER OPERATE?

Study the planter and the operator's manual and see if the planter can be set to drill corn. Can it be set to hill-drop one kernel per hill? How is it set to drop two kernels per hill? Can it be set to hill-drop three kernels per hill? Will it drop four kernels per hill?

Trace the power train from the seed plates to the drive wheels. What effect will it have on the number of seeds per hill if the drive chain is placed on a larger sprocket? What effect does increased ground speed have on seed plate speed? How is the planter changed to plant soybeans instead of corn?

Trace the power train to the fertilizer unit, herbicide, and insecticide attachments.

What effect does the runner have on seed placement? How is depth of planting increased? Why are furrow openers used? When are covering attachments used? How is the planter timed? Do the planting units operate separately?

## HOW DOES THE MARKER WORK?

### Automatic markers

The automatic markers raise and lower with the planter frame. They will operate efficiently and automatically if they are set correctly. The proper timing sequence can be set by manually changing the marker control lever or the ratchet timing dial when the planter is raised. Once the proper timing sequence is established, the markers will continue to operate with alternate markers dropping and raising as the planter is lowered and raised.

### Grass waterway attachment

When planting fields with grass waterways, the marker will raise as the planter is raised to cross the waterway. Upon leaving the waterway, the opposite marker would normally drop because of the alternating feature of the automatic mechanism. With a grass waterway attachment, the desired marker will fall when the correct rope is pulled.

### Dual marker control

A dual marker control is desirable when planting in irregularly-shaped fields so both markers may be lowered when starting in the center of a field or on a terrace.

## 3. WHAT IS THE PROPER WAY TO ADJUST THE PLANTER?

With other farm operations like plowing, cultivating, or harvesting, you have an easy check on the operation and efficiency of the machine. Just a glance from the tractor seat will tell you what kind of job is being done when you are plowing. A more thorough inspection can be quickly made by checking depth, etc., as you walk around the plow. With the corn planter, however, a glance at the field behind the planter will only tell you if you are planting in straight rows and with some of the newer attachments even the wheel tracks may be covered over. You can not really tell what kind of job you've done with the planter until at least ten days after planting. As the corn plants emerge, you have a check on the effectiveness of the insecticide. As the plants continue to grow rapidly, you have a check on the starter fertilizer application and as the plants grow in a row almost free of weeds you have a check on the herbicide application. Now, it is relatively too late to

make any correction for this year's crop. Any checks must be made prior to the planting season by careful calibration of the planter before the rush of the planting season begins.

There are many variations in planting conditions! Soil types vary from one field to another; one planting season is damp and cold; another is hot and dry; and one field is more fertile than another. Soybeans may be profitably planted in narrower rows than corn. A particular hybrid that was planted last year is no longer available. A new variety of corn shows great promise.

Farmers want planters that can be adjusted for different row widths, planting rates, hill spacings in the row, drilling distances, planting depths, fertilizer rates and locations, kinds of crops, herbicide rates, and insecticide rates. In order to adjust a planter to meet these and other variations in planting conditions, you must be familiar with planter adjustment.

Study your planter and the operator's manual (Fig. 43). Can row width be varied? What row widths are possible? How can row widths be changed? Must the fertilizer discharge be changed? Will it be necessary to change the marker if row widths are changed?

Fig. 43. Study the operator's manual carefully. Keep it handy, in a safe place for future reference.

## Row width

Changing row widths is currently receiving a great deal of attention. There is always interest among good farmers in ways to increase corn yields. One method that has attracted considerable interest is to change to narrow-row corn. The Agronomy Department of the University of Illinois has found that at high yield levels, corn yields benefit about five percent from narrowing rows from 40 inches to 30 inches. In no case did they find corn planted in 30-inch rows yielding less than corn planted in 40-inch rows. Soybean yields have been found to increase from 10 to 15% due to narrow rows.

Lodging and stalk breakage in corn seem to increase with narrow rows. Shorter, earlier hybrids yield better than tall late varieties. Narrow-row corn makes more efficient use of light and moisture and there is less competition from weeds. Changing to narrow rows is primarily an economic decision and many factors must be considered before making the change.

## Planting rate

The importance of correct planting rate has been mentioned earlier. Select the proper population for the fertility and moisture level of your field.

The plant population at harvest time is usually less than the number of kernels planted or assumed to have been planted. This reduction in number can be caused by all or any one of the causes discussed here. Wheel slippage at planting time, losses from cultivation, damage by insects, competition from weeds, and failure to germinate usually reduces the population 15 to 20%.

Buying poorly graded seed can cause inaccurate planting. A seed plate actually grades seed corn. Larger kernels tend to be retained in the hopper while smaller ones are planted. For this reason, it is a good idea to dump all hoppers occasionally because the larger kernels accumulate and may actually prevent good cell fill. Failure to do this has caused some farmers to have a diminishing plant population from the desired planting rate they started with.

Planting too fast will result in a lower planting rate than expected. If the seed plates turn too fast, there will be an incomplete cell fill. When planting at faster speeds (4-5 miles per hour) the seeds should fit in the cells with sufficient clearance to allow them to enter and leave the cells freely. If the seed fits the cell too snugly, it won't have time to settle in the cell before reaching the cutoff and will be crowded back into the hopper. The addition of powdered graphite to the seed corn will improve the cell fill at higher speeds. Empty cells mean a lower planting rate than expected. The tables shown in the operator's manuals for different hill spacings also suggest a recommended planter speed.

The operator's manual also suggests a specified tire size and tire pressure. If tires are the wrong size or are not inflated to the correct pressures, then the planting rate will vary from the expected rate. If the planter wheels slip, the planting rate will be decreased.

If you calibrate your planter at one speed and plant at a different speed, you will not plant at the rate you expected.

The cut-off pawls are often a cause for inaccurate planting, even in a new planter. If the cut-off pawls stick open or are worn, then more kernels will be planted and you will overplant the field. If they stick closed or are too long, they may reduce the number of kernels planted. If the knockout pawls are worn or have weak springs, the planting rate will be reduced. If chain drives are placed on the wrong sprockets, the planting rate cannot be correct.

The corn planter can also be calibrated by pulling it at field travel speed in the barnyard. Lower the runners until they are just above the surface of the soil. On most planters the seed plates can be driven without lowering the runners but lowering the runners will keep the kernels closer together. Use the instruction book to find how to move the proper lever to put the planter in gear so the plates will turn. On some planters, it may be necessary to wire the seed plate drive in this position to keep it engaged. On others, it may be necessary to block the valves open. Count the kernels for 66 feet for 40-inch rows, 72 feet for 36-inch rows and 87 feet for 30-inch rows. Then by multiplying the number of kernels in each row by 200, you will get the kernels per acre.

To insure planting at the correct rate:

(1) Buy well graded seed.

(2) Select seed plates carefully and check them on the dealer's seedplate test stand.

(3) Check to see that all parts of the hopper bottoms are working properly, such as, cut-off pawls, knock-out pawls, and springs. See that the parts are free of excessive accumulations of dust, chaff, and rust.

(4) Check the general condition of the planter sprockets, gears, tires, etc.

(5) Check to see that chains are on the correct sprockets and the selector lever set correctly.

(6) Calibrate the planter at the speed at which planting will be done.

Hill spacings

These are determined by the choice of sprockets (drive and driven) and the accumulator plate or the striker and selector lever position for planters so equipped.

Table 1 taken from an operator's manual shows the hilling distance variations that are possible by changing the striker, shift lever, and gear case chain drive.

Table 2 taken from an operator's manual shows the hill spacing variations that are possible by changing the lugs on the rotor, using the accumulator plate, and changing the drive chain to different sprockets.

**Table 1. Approximate Hilling Distances and Maximum Recommended Speed For Planter Equipped with 6.70x15 Tires Inflated to 24 Pounds Air Pressure**

| For a hilling distance of | Maximum recommended speed | Kernels per hill | | Use striker | Set shift lever on | Set gear case drive chain on | |
|---|---|---|---|---|---|---|---|
| | | 16-cell plates | 24-cell plates | | | Drive sprocket | Driven sprocket |
| 11.6" | 2. mph | 2 | 3 | Double | 4 | 18-Tooth | 7-Tooth |
| 13.2" | 2.5 mph | 2 | 3 | Double | 4 | 18-Tooth | 8-Tooth |
| 15.6" | 3. mph | 2 | 3 | Double | 3 | 18-Tooth | 7-Tooth |
| 17.6" | 3.5 mph | 2 | 3 | Double | 3 | 18-Tooth | 8-Tooth |
| 19. " | 3.75 mph | 2 | 3 | Double | 4 | 11-Tooth | 7-Tooth |
| 21.8" | 4. mph | 2 | 3 | Double | 4 | 11-Tooth | 8-Tooth |
| 23.2" | 2.75 mph | 4* | - | Single | 4 | 18-Tooth | 7-Tooth |
| 23.2" | 4.25 mph | 2 | 3 | Double | 2 | 18-Tooth | 7-Tooth |
| 25.4" | 4.75 mph | 2 | 3 | Double | 3 | 11-Tooth | 7-Tooth |
| 26.4" | 3.25 mph | 4 | - | Single | 4 | 18-Tooth | 8-Tooth |
| 26.4" | 5. mph | 2 | 3 | Double | 2 | 18-Tooth | 8-Tooth |
| 29. " | 5.25 mph | 2 | 3 | Double | 3 | 11-Tooth | 8-Tooth |
| 31.2" | 3.75 mph | 4 | - | Single | 3 | 18-Tooth | 7-Tooth |
| 35.2" | 4.25 mph | 4 | - | Single | 3 | 18-Tooth | 8-Tooth |
| 38. " | 4.50 mph | 4 | - | Single | 4 | 11-Tooth | 7-Tooth |
| 38. " | 4.75 mph | 2 | 3 | Double | 2 | 11-Tooth | 7-Tooth |
| 43.6" | 5.25 mph | 4 | - | Single | 4 | 11-Tooth | 8-Tooth |
| 43.6" | 6. mph | 2 | 3 | Double | 2 | 11-Tooth | 8-Tooth |
| 46.4" | 5.75 mph | 4 | - | Single | 2 | 18-Tooth | 7-Tooth |
| 50.8" | 6. mph | 4 | - | Single | 3 | 11-Tooth | 7-Tooth |
| 53.2" | 6. mph | 4 | - | Single | 2 | 18-Tooth | 8-Tooth |
| 58. " | 6. mph | 4 | - | Single | 3 | 11-Tooth | 8-Tooth |
| 76. " | 6. mph | 4 | - | Single | 2 | 11-Tooth | 7-Tooth |
| 87.2" | 6. mph | 4 | - | Single | 2 | 11-Tooth | 8-Tooth |

## Drilling distances

Drilling distances are determined by the choice of seed plate, choice of sprockets (drive and driven), and the choice of selector lever position. Table 3 shows the drilling distances in inches for different seed plates. Table 4 shows the drilling distances for another planter.

Notice that increasing the number of cells in the seed plate reduces the drilling distances. This is logical, because with the seed plate turning at the same rate the increased number of openings will permit seeds to drop closer together.

One model planter power drills one seed at a time by bolting two extra ejector lugs to the rotor. If straight drilling is desired, the accumulator plate is removed. By removing the valve, the planter can be made to operate like a drill planter.

## Planting depth

On trailing planters the planting depth is gauged by the press wheel and not the hydraulic cylinder. The depth of each unit is adjusted by setting a depth adjusting pin. Moving the pin up one hole adds approximately 1/2 inch to the planting depth (Fig. 44). The pressure on the pressure springs helps insure uniform planting depth (Fig. 45).

## Table 2. Approximate Hill Spacings and Plant Populations (Based on 6.70 x 15 planter tires)

| Drive Chain Sprocket (teeth on sprockets) | | Planter Speed Recommended (m.p.h.) | 16-Cell Seed Plates | | | |
|---|---|---|---|---|---|---|
| | | | | Hill Spacings (inches apart) | | |
| | | | | Seeds per Hill | | |
| Sprocket on Countershaft | Sprocket on Drill Shaft | | Plant Population per acre (40" rows) | One (See Note A) | Two | Three (See Note B) |
| 18 | 8 | 3.5 | 26,100 | 6.0 | 12.0 | 18.0 |
| 16 | 8 | 4 | 23,100 | 6.8 | 13.5 | 20.3 |
| 18 | 10 | 4.5 | 20,800 | 7.5 | 15.1 | 22.6 |
| 13 | 8 | 5 | 18,800 | 8.3 | 16.7 | 25.0 |
| 16 | 10 | 5 | 18,500 | 8.5 | 16.9 | 25.4 |
| 18 | 12 | 5.5 | 17,350 | 9.0 | 18.0 | 27.0 |
| 18 | 13 | 6 | 16,000 | 9.8 | 19.5 | 29.3 |
| 16 | 12 | 6 | 15,400 | 10.1 | 20.3 | 30.4 |
| 13 | 10 | 6 | 15,000 | 10.4 | 20.9 | 31.2 |
| 16 | 13 | 6.5 | 14,230 | 11.0 | 22.0 | 33.0 |
| 18 | 16 | 7 | 13,000 | 12.0 | 24.1 | 36.2 |
| 13 | 12 | 7 | 12,520 | 12.5 | 25.0 | 37.5 |
| 18 | 17 | 7 | 12,400 | 12.6 | 25.2 | 37.9 |
| 13 | 13 | 7 | 11,580 | 13.5 | 27.0 | 40.5 |
| 16 | 16 | 7 | 11,580 | 13.5 | 27.0 | 40.5 |
| 16 | 17 | 7 | 10,900 | 14.4 | 28.7 | 43.1 |
| 13 | 16 | 7 | 9,350 | 16.7 | 33.5 | 50.2 |
| 13 | 17 | 7 | 8,830 | 17.7 | 35.5 | 53.2 |

| Drive Chain Sprocket (teeth on sprockets) | | Planter Speed Recommended (m.p.h.) | 24-Cell Seed Plates | | | |
|---|---|---|---|---|---|---|
| | | | | Hill Spacings (inches apart) | | |
| | | | | Seeds per Hill | | |
| Sprocket on Countershaft | Sprocket on Drill Shaft | | Plant Population per acre (40" rows) | One (See Notes A and C) | Two (See Note C) | Three |
| 18 | 8 | 3.5 | 39,200 | 4.0 | 8.0 | 12.0 |
| 16 | 8 | 4 | 34,700 | 4.5 | 9.0 | 13.5 |
| 18 | 10 | 4.5 | 31,200 | 5.0 | 10.0 | 15.0 |
| 13 | 8 | 5 | 28,200 | 5.6 | 11.1 | 16.7 |
| 16 | 10 | 5 | 27,800 | 5.6 | 11.2 | 16.9 |
| 18 | 12 | 5.5 | 26,000 | 6.0 | 12.0 | 18.0 |
| 18 | 13 | 6 | 24,000 | 6.5 | 13.0 | 19.5 |
| 16 | 12 | 6 | 23,100 | 6.7 | 13.5 | 20.3 |
| 13 | 10 | 6 | 22,500 | 7.0 | 13.9 | 20.9 |
| 16 | 13 | 6.5 | 21,400 | 7.3 | 14.7 | 22.0 |
| 18 | 16 | 7 | 19,500 | 8.0 | 16.0 | 24.1 |
| 13 | 12 | 7 | 18,800 | 8.3 | 16.6 | 25.0 |
| 18 | 17 | 7 | 18,600 | 8.4 | 16.8 | 25.2 |
| 13 | 13 | 7 | 17,400 | 9.0 | 18.0 | 27.0 |
| 16 | 16 | 7 | 17,400 | 9.0 | 18.0 | 27.0 |
| 16 | 17 | 7 | 16,400 | 9.6 | 19.2 | 28.7 |
| 13 | 16 | 7 | 14,000 | 11.1 | 22.3 | 33.5 |
| 13 | 17 | 7 | 13,220 | 11.8 | 23.6 | 35.4 |

Note A - Use four lugs on rotor. Remove accumulator plate.
Note B - Replace the 12-tooth sprocket on the rotor shaft with the special 18-tooth sprocket. Remove accumulator plate.
Note C - Replace the 12-tooth sprocket on the hopper shaft with the special 18-tooth sprocket Remove accumulator plate.

## Table 3. Approximate Drilling Distances in Inches

| Drilling Distance Cells in Seed Plate 12 | 16 | 20 | 24 | Set Shift Lever on | Set Drive Sprocket on | Set Driven Sprocket on |
|---|---|---|---|---|---|---|
| [illegible] | [illegible]1" | 4.8" | 4.[illegible]" | 4 | 18-Tooth | 7-Tooth |
| [illegible] | 6.9" | 5.5" | 4.6" | 4 | 18-Tooth | 8-Tooth |
| 10.9" | 8.2" | 6.5" | 5.4" | 3 | 18-Tooth | 7-Tooth |
| 12.3" | 9.2" | 7.3" | 6.1" | 3 | 18-Tooth | 8-Tooth |
| 13.2" | 10.[illegible]" | 7.9" | 6.6" | 4 | 11-Tooth | 7-Tooth |
| 15.2" | 11.4" | 9.1" | 7.5" | 4 | 11-Tooth | 8-Tooth |
| 16.2" | 12.1" | 9.7" | 8.[illegible]" | 2 | 18-Tooth | 7-Tooth |
| 17.7" | 13.3" | 10.7" | 8.8" | 3 | 11-Tooth | 7-Tooth |
| 18.4" | 13.9" | 11.1" | 9.2" | 2 | 18-Tooth | 8-Tooth |
| 20.2" | 15.2" | 12.1" | 10.[illegible]" | 3 | 11-Tooth | 8-Tooth |
| 26.4" | 19.9" | 15.9" | 13.2" | 2 | 11-Tooth | 7-Tooth |
| 30.3" | 22.8" | 18.2" | 15.2" | 2 | 11-Tooth | 8-Tooth |

## Table 4. Drilling Distances

| Drive Chain Sprocket (teeth on sprockets) | | Cells in Seed Plate (inches apart in row) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sprocket on Countershaft | Sprocket on Drill Shaft | 16 | 22 | 24 | 29 | 34 | 38 | 40 |
| 18 | 8 | 6.0 | 4.4 | 4.0 | 3.3 | 2.8 | 2.5 | 2.4 |
| 16 | 8 | 6.8 | 4.9 | 4.5 | 3.7 | 3.2 | 2.8 | 2.7 |
| 18 | 10 | 7.5 | 5.5 | 5.0 | 4.1 | 3.5 | 3.2 | 3.0 |
| 13 | 8 | 8.3 | 6.0 | 5.6 | 4.6 | 3.9 | 3.5 | 3.3 |
| 16 | 10 | 8.5 | 6.2 | 5.6 | 4.7 | 4.0 | 3.6 | 3.4 |
| 18 | 12 | 9.0 | 6.5 | 6.0 | 5.0 | 4.2 | 3.8 | 3.6 |
| 18 | 13 | 9.8 | 7.1 | 6.5 | 5.4 | 4.6 | 4.1 | 3.9 |
| 16 | 12 | 10.1 | 7.3 | 6.7 | 5.6 | 4.8 | 4.3 | 4.0 |
| 13 | 10 | 10.4 | 7.6 | 7.0 | 5.8 | 4.9 | 4.4 | 4.2 |
| 16 | 13 | 11.0 | 8.1 | 7.3 | 6.1 | 5.2 | 4.7 | 4.4 |
| 18 | 16 | 12.0 | 9.7 | 8.0 | 6.6 | 5.7 | 5.1 | 4.8 |
| 13 | 12 | 12.5 | 9.1 | 8.3 | 6.9 | 5.9 | 5.3 | 5.0 |
| 18 | 17 | 12.6 | 9.2 | 8.4 | 7.0 | 5.9 | 5.3 | 5.0 |
| 13 | 13 | 13.5 | 9.8 | 9.0 | 7.4 | 6.3 | 5.7 | 5.4 |
| 16 | 16 | 13.5 | 9.8 | 9.0 | 7.4 | 6.3 | 5.7 | 5.4 |
| 16 | 17 | 14.4 | 10.4 | 9.6 | 7.9 | 6.7 | 6.0 | 5.7 |
| 13 | 16 | 16.7 | 12.2 | 11.1 | 9.2 | 7.9 | 7.0 | 6.7 |
| 13 | 17 | 17.7 | 12.9 | 11.8 | 9.8 | 8.3 | 7.5 | 7.1 |

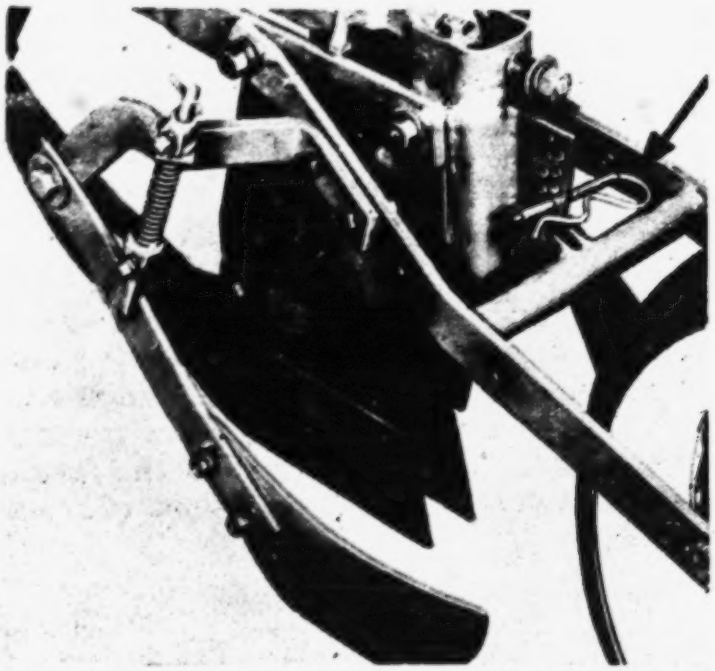


Fig. 44. Moving the cotter pin up to the next hole adds approximately ½-inch to the planting depth.

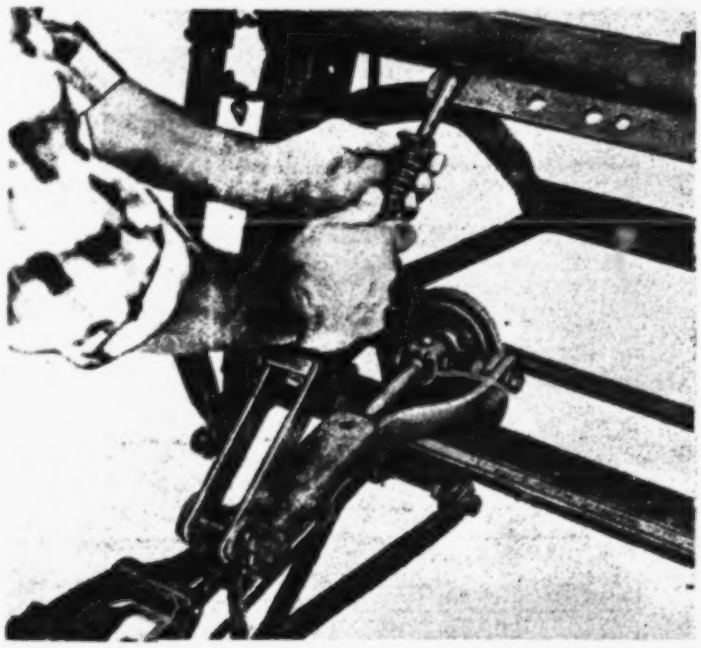


Fig. 45. Compressing the pressure springs increases the down pressure on the runners. Do not attempt to penetrate plow pan or extremely hard soil by increasing the pressure. In hard ground excessive pressure can cause the drive wheels to lift off the ground.

**Table 5. Delivery Rates of Dry Fertilizer (Pounds per acre)**

| *Calculated for 40-Inch Row Spacing and 10-10-10 Fertilizer | | | | |
|---|---|---|---|---|
| Pounds per Acre Type of Auger | | | Differential Sprocket | Fertilizer Sprocket |
| Low | Reg. | High | | |
| 52 | 104 | 156 | 9-Tooth | 18-Tooth |
| 63 | 125 | 188 | 9-Tooth | 15-Tooth |
| 79 | 157 | 236 | 12-Tooth | 18-Tooth |
| 94 | 188 | 282 | 12-Tooth | 15-Tooth |
| 105 | 209 | 314 | 9-Tooth | 9-Tooth |
| 118 | 236 | 354 | 9-Tooth | 8-Tooth |
| 142 | 283 | 425 | 18-Tooth | 15-Tooth |
| 157 | 313 | 470 | 12-Tooth | 9-Tooth |
| 177 | 353 | 530 | 12-Tooth | 8-Tooth |
| 235 | 470 | 705 | 18-Tooth | 9-Tooth |
| 264 | 528 | 792 | 18-Tooth | 8-Tooth |

**Table 6. Delivery Rates of Dry Fertilizer**

| 40" Rows | | | |
|---|---|---|---|
| Sprocket on Main Drive Shaft | Sprocket on Fertilizer Feed Shaft | Pounds Per Acre Low Rate Auger | Pounds Per Acre High Rate Auger |
| 8-Tooth | 18-Tooth | 50 | 115 |
| 8-Tooth | 15-Tooth | 60 | 140 |
| 12-Tooth | 18-Tooth | 75 | 170 |
| 12-Tooth | 15-Tooth | 90 | 205 |
| 8-Tooth | 9-Tooth | 100 | 230 |
| 17-Tooth | 18-Tooth | 105 | 240 |
| 8-Tooth | 8-Tooth | 110 | 260 |
| 17-Tooth | 15-Tooth | 130 | 290 |
| 12-Tooth | 9-Tooth | | 340 |
| 12-Tooth | 8-Tooth | | 385 |
| 17-Tooth | 9-Tooth | | 485 |
| 17-Tooth | 8-Tooth | | 540 |

## Fertilizer rates and locations

Dry fertilizer. Rates of dry fertilizer are adjusted by selecting a low or high rate auger and by selecting the correct sprockets (drive and driven). Table 5 shows the dry fertilizer rates in pounds per acre for one planter while Table 6 shows the fertilizer rates for another planter.

The charts serve as a guide but they are not precise. Dry fertilizer is metered by volume and not by weight so the weight metered may vary as much as 100% from the weight calculated in the charts. For accurate metering of the fertilizer, it is important that the augers be properly assembled -- the large tapered ends should be on the outside with the small tapers toward the center. A diagram similar to Fig. 46 and complete information are in the operator's manual.

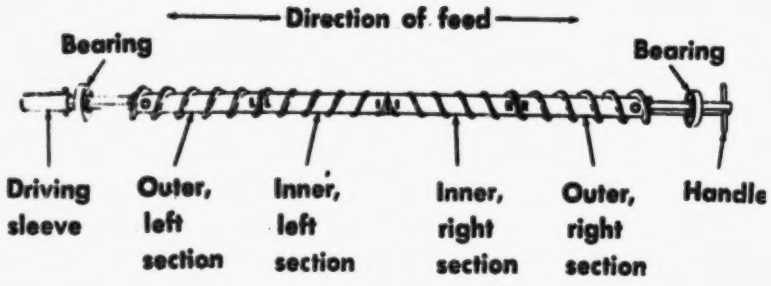



Fig. 46. When the augers are removed for cleaning, it is important that they be re-assembled correctly as shown in the operator's manual.

On some planters the fertilizer can be applied in a short band next to the hill when hill-drop or check-row planting corn (Fig. 47). A striker plate is set to trip the pull rod on the fertilizer valves.

Shop calibration can be done with fertilizer in the hopper, and the planter on supports by placing a container under the discharge opening and turning the wheels ten revolutions. Measure the circumference of the tire and calculate the distance traveled. Multiply the distance by the width of the row. Divide this figure by 43,560. This gives the fraction of an acre covered. Weigh the fertilizer and divide by the fraction of an acre covered. The result will be approximately the amount applied per acre. It takes a great deal of effort to turn the wheels manually at the proper speed. On some planters the differential in the drive mechanism may also affect the calibrated rate of application. Field planting conditions may cause the applied rate to vary greatly from the rate calibrated in the shop.

Field calibration may be done by removing one delivery tube and tying a bag to the spout under the hopper. Engage the fertilizer attachment and drive forward 131 feet at the speed at which planting will be done. Weigh the amount of fertilizer caught and multiply this by 100. The result will be the pounds of fertilizer delivered per acre when planting 40-inch rows.

The fertilizer openers have a drawbar linkage that gives unrestricted flotation (if they are not integral parts of the runner openers). The separate openers can be shifted to place fertilizer on either side of the seed and below if desired. The drawbars should retain vertical flexibility with the pressure springs for protection against breakage as well as penetration.

Liquid fertilizer. Rates of liquid fertilizer are determined by the metering head and the rate of travel. Table 7 shows the approximate delivery rates for a planter. Notice that for any given orifice, the rate of application decreases as the speed of travel increases.

Table 7. Delivery Rates of Liquid Fertilizer (Pounds per acre)

*Calculated for 40" Row Spacing

| LOW RANGE ORIFICE DISK No. 1 | | | |
|---|---|---|---|
| Speed | | | Orifice Number |
| 3 mph | 4 mph | 5 mph | |
| 42 | 31 | 25 | 1 |
| 67 | 50 | 40 | 2 |
| 100 | 75 | 60 | 3 |
| 150 | 112 | 90 | 4 |
| 183 | 138 | 110 | 5 |
| 200 | 150 | 120 | 6 |

| HIGH RANGE ORIFICE DISK No. 2 | | | |
|---|---|---|---|
| Speed | | | Orifice Number |
| 3 mph | 4 mph | 5 mph | |
| 242 | 181 | 145 | 1 |
| 283 | 212 | 170 | 2 |
| 325 | 244 | 195 | 3 |
| 392 | 294 | 235 | 4 |
| 420 | 315 | 252 | 5 |
| 483 | 362 | 290 | 6 |

| EXTRA HIGH RANGE ORIFICE DISK No. 3 | | | |
|---|---|---|---|
| Speed | | | Orifice Number |
| 3 mph | 4 mph | 5 mph | |
| 517 | 388 | 310 | 1 |
| 575 | 431 | 345 | 2 |
| 670 | 478 | 382 | 3 |
| 703 | 528 | 422 | 4 |
| 775 | 581 | 465 | 5 |

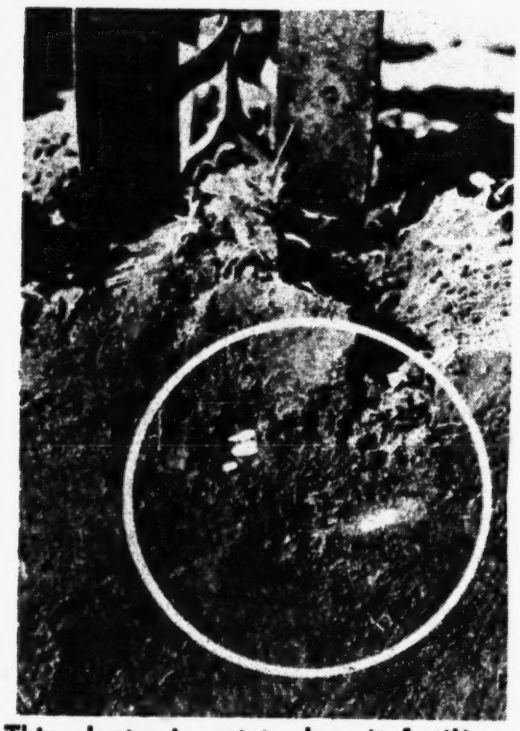


Fig. 47. This planter is set to deposit fertilizer slightly below the hill of corn.

## Different crops

A wide variety of crops can be planted with the conventional planter by changing plates. Soybeans are an important crop in the midwest. To plant soybeans with the planter, it may be desirable to change row spacings to a narrower row. Table 8 shows the distribution table for a planter for 40-inch rows. When row widths to be planted are other than 40-inch, allow for the difference when calculating pounds per acre or plant population per acre as follows:

| Row width | Multiply by |
|---|---|
| 38 | 1.05 |
| 36 | 1.11 |
| 34 | 1.18 |
| 32 | 1.25 |
| 30 | 1.33 |
| 28 | 1.43 |

Table 9 shows the approximate pounds per acre with two different seed plates for a planter. When planting soybeans with this planter, you may have to remove the chain valve to reduce wear on the valve assembly.

## Herbicide applications

The granular applicators are mounted on the planter frame or on fenders over the press wheels, and distribute a band of granular herbicide behind the press wheels (Fig. 48). Most applicators are considered gravity flow de-

Table 8. Distribution Table for Soybeans

| Drive Chain Sprocket (teeth on sprockets) | | SEED PLATE (pounds per acre - 40" rows) | | | | | |
|---|---|---|---|---|---|---|---|
| Sprocket on Countershaft | Sprocket on Drill Shaft | 3127A 22-Cell | 3301A 34-Cell | 3114A 24-Cell | 3231A 38-Cell | 1926A 29-Cell | 3302A 29-Cell |
| 18 | 8 | 137 | 99 | 76 | 65 | 56 | 45 |
| 16 | 8 | 123 | 87 | 67 | 58 | 50 | 40 |
| 18 | 10 | 110 | 79 | 60 | 52 | 45 | 36 |
| 13 | 8 | 99 | 71 | 54 | 47 | 40 | 36 |
| 16 | 10 | 97 | 70 | 54 | 46 | 40 | 32 |
| 18 | 12 | 91 | 64 | 50 | 43 | 37 | 30 |
| 18 | 13 | 84 | 61 | 46 | 40 | 35 | 28 |
| 16 | 12 | 81 | 59 | 45 | 39 | 33 | 27 |
| 13 | 10 | 79 | 57 | 44 | 38 | 33 | 26 |
| 16 | 13 | 75 | 54 | 41 | 36 | 31 | 25 |
| 18 | 16 | 68 | 49 | 38 | 33 | 28 | 23 |
| 13 | 12 | 66 | 48 | 36 | 32 | 27 | 22 |
| 18 | 17 | 66 | 47 | 36 | 21 | 27 | 22 |
| 13 | 13 | 61 | 44 | 33 | 29 | 25 | 20 |
| 16 | 16 | 61 | 44 | 33 | 29 | 25 | 20 |
| 16 | 17 | 57 | 41 | 32 | 27 | 24 | 19 |
| 13 | 16 | 49 | 36 | 27 | 23 | 20 | 16 |
| 13 | 17 | 46 | 33 | 26 | 22 | 19 | 15 |

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Table 9. Approximate Pounds of Soybeans per Acre With 20-Cell Plates

Based on a Speed of 5 Miles per Hour

| Pounds per Acre Row Width | | | Set Shift Lever on | Set Drive Sprocket on | Set Driven Sprocket on |
|---|---|---|---|---|---|
| 36" | 38" | 40" | | | |
| 27 Lbs. | 25 Lbs. | 24 Lbs. | 2 | 11-Tooth | 8-Tooth |
| 29 Lbs. | 27 Lbs. | 26 Lbs. | 2 | 11-Tooth | 7-Tooth |
| 38 Lbs. | 37 Lbs. | 34 Lbs. | 3 | 11-Tooth | 8-Tooth |
| 43 Lbs. | 41 Lbs. | 39 Lbs. | 3 | 11-Tooth | 7-Tooth |
| 43 Lbs. | 41 Lbs. | 40 Lbs. | 2 | 18-Tooth | 8-Tooth |
| 45 Lbs. | 43 Lbs. | 41 Lbs. | 4 | 11-Tooth | 8-Tooth |
| 50 Lbs. | 48 Lbs. | 45 Lbs. | 2 | 18-Tooth | 7-Tooth |
| 51 Lbs. | 49 Lbs. | 46 Lbs. | 4 | 11-Tooth | 7-Tooth |
| 56 Lbs. | 54 Lbs. | 51 Lbs. | 3 | 18-Tooth | 8-Tooth |
| 71 Lbs. | 67 Lbs. | 64 Lbs. | 3 | 18-Tooth | 7-Tooth |
| 73 Lbs. | 69 Lbs. | 66 Lbs. | 4 | 18-Tooth | 8-Tooth |
| 85 Lbs. | 80 Lbs. | 76 Lbs. | 4 | 18-Tooth | 7-Tooth |

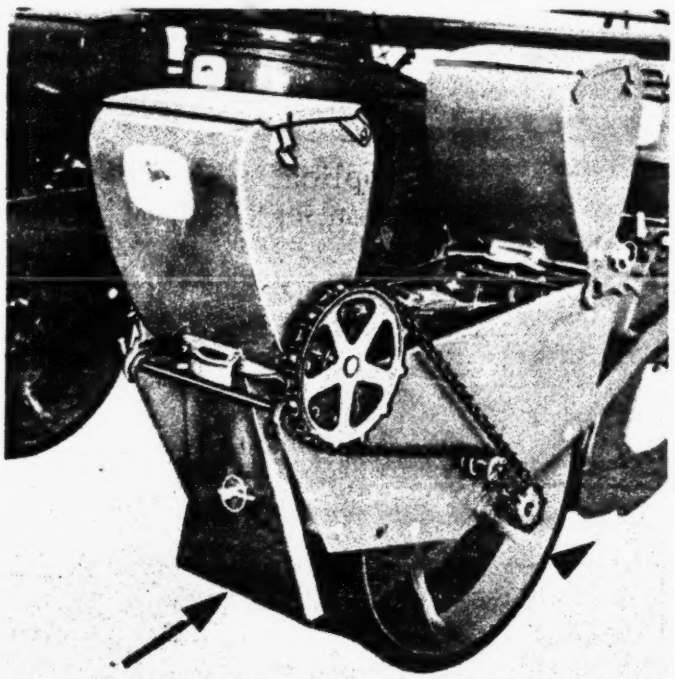

Fig. 48. The herbicide is distributed over the row by a diffuser.

vices, since the rate is varied by changing the size of opening in the hopper bottom. The rotor in the hopper serves primarily to prevent bridging and assure a supply of granules to the opening. The amount of material fed is more a function of time than of distance traveled. Any changes in travel speed or size, shape, or density of the granules requires recalibration.

The liquid herbicide is usually applied under pressure from a supply tank (Fig. 49). The nozzles are mounted behind the press wheels and the height of the nozzles determines the width of pattern.

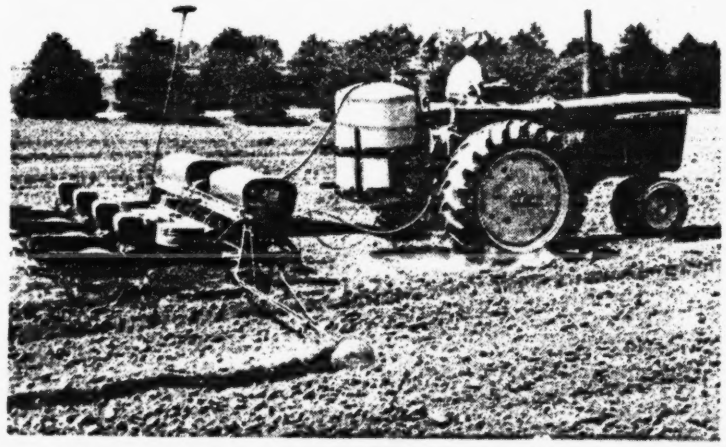

Fig. 49. A pump driven by the tractor power-take-off delivers liquid herbicide to the nozzles back of the press wheels.

Calibration of granular pesticides (herbicides and insecticides) should be done for the rate (number of pounds per acre) at the normal planting speed. Attach a cloth bag over the diffuser or the discharge tube, lower the planter and drive a complete row (preferably in the field at planting speed). Weigh the herbicide (or insecticide) caught in the cloth bag and calculate the rate per acre.

Make the necessary adjustments and recheck. This calibration should be done for both pesticides for each planting unit.

Calibration of liquid herbicide (and insecticide) applicators can be done by the following method. Drive a measured distance

of 176 feet in the field at the speed at which planting will be done. Record the time it takes to travel to 176 feet. Note the rpm of the engine or mark the throttle quadrant. With the tractor and planter stationary and the spraying pressure at 20 - 40 psi, place a container under a nozzle and advance the throttle to the rpm used in the field. Measure the amount of fluid caught under the nozzle in the recorded time.

Adjust pressure or change nozzles until the proper output is obtained.

Insecticide applications

Granular insecticide is placed in the furrow at the back of the runner (Fig. 50). Granular applicators are mounted on the press-wheel fenders or on the planter frame and the insecticide is delivered to the furrow through a spout connected to the rear of the runner.

Liquid insecticide is sometimes applied with liquid fertilizer. If applied separately, it should be applied in the furrow ahead of the press wheel.

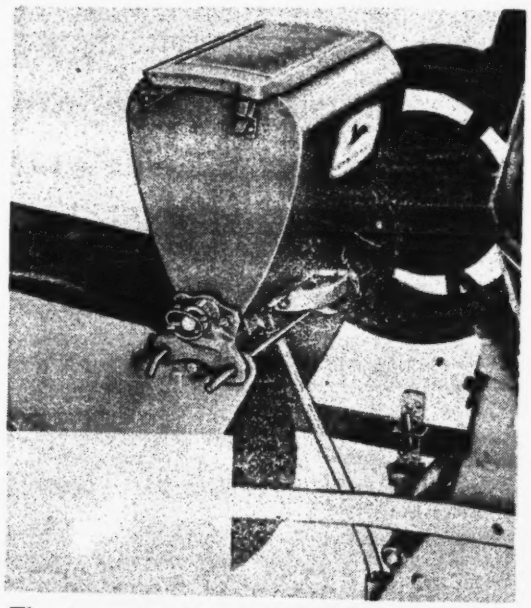

Fig. 50. The insecticide attachment is mounted in front of the press wheels and the insecticide flows through the plastic tube to the furrow.

## 4. HOW SHOULD I USE A PLANTER?

Safety practices

Permit only one person on the tractor while the tractor and planter are in operation. Never permit others (especially children) to ride on the planter.

Do not drive at excessive speed (Fig. 51).

Do not clean, lubricate, or adjust the planter when it is in motion.

Be especially careful when operating on hillsides because the tractor may tip sideways if it strikes a hole, ditch, or bump.

Lower the planter to the ground when it is not in use (Fig. 52). Whenever possible, perform service work and adjustments with the planter on the ground. If the planter must be in the raised position while working on it, be sure it is securely supported on blocks.

Leave ample clearance when making turns (Fig. 53).

Lock the marker chains in transport position at all times except when actually planting. Markers can be accidentally tripped causing injury to someone or damage to the marker (Fig. 54). Keep the loose end of the marker chain from dangling.

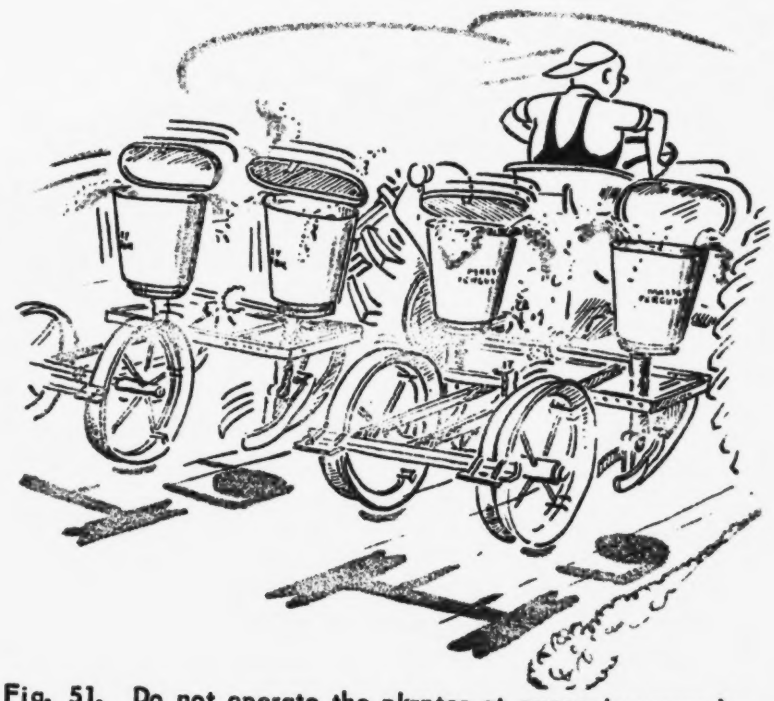

Fig. 51. Do not operate the planter at excessive speeds.

Fig. 52. Never leave the planter in a raised position.

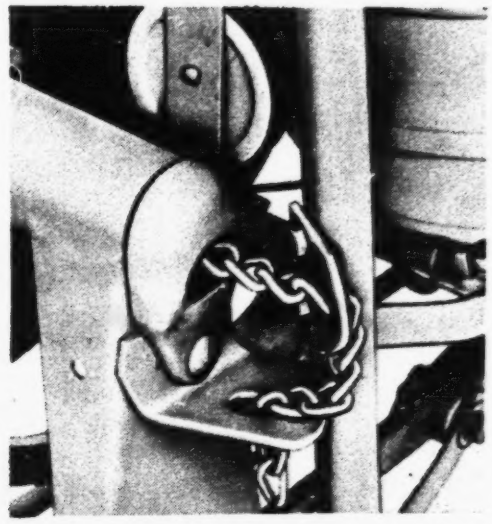

Fig. 54. Lock the marker in transport position at all times, except when actually planting.

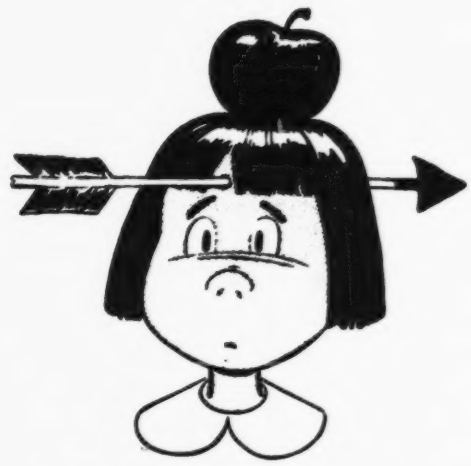

Fig. 55. Haste causes accidents.

Fig. 53. Do not turn too fast and strike the planter on trees, fences, or gate posts.

Do not hurry when working around implements. Haste causes accidents (Fig. 55).

Always check behind the planter when backing the unit to avoid injuring a person or damaging the planter.

Keep small children away from the planter.

Use warning flags or Slow Moving Vehicle emblems when transporting the planter on the highway in the daytime. Use accessory lights for adequate warning to other vehicle operators at night or dusk.

<u>What preparation should be made to use the planter?</u>

Clean the planter thoroughly. Be sure there are no obstructions in the valves.

Inflate the planter tires to the pressure suggested in the operator's manual.

Stop the tractor engine and let it cool before refueling. Do not smoke during refueling. A tractor fire will cause a greater delay in planting than a few seconds required to start the tractor engine.

Move the planting units to the desired row widths. Set the fertilizer openers as recommended in the operator's manual. Set the markers for the row width chosen.

Inspect the seed hopper bottoms. Be sure the cut-off pawls and knockers are free.

Set the hitch clevis so the planter is level when operating.

Be sure the marker-control latch is lubricated and working freely.

Be sure all set screws and bolts are tight and all cotters spread, to keep them from falling out.

Be sure all hose connections and gaskets are tight on liquid fertilizer attachments. If dry fertilizer parts were oiled when the planter was stored, wipe all parts dry.

Set the planting depth desired.

Check the planter parts for excessive wear.

Match the seed to the seed plate as discussed above. Check seed plates for wear. If the center of the seed plate is worn, there will be so much play between the seed plate and the side of the hopper bottom that there will be an imperfect cell fill.

Calibrate the seeding rate at the correct planting speed.

Calibrate the fertilizer applicator.

Calibrate the pesticide applicator(s).

Lubrication. First of all, consult the lubrication charts in the operator's manual for instructions on lubricating the planter as shown in Fig. 56. Check the oil level in the gear case if the planter is so equipped. Keep the clutch (or clutches) well lubricated for positive and easy action. Marker chains last longer and operate easier if they have a light coating of oil. Chain tighteners that turn freely provide less resistance to the moving chain so it is advisable to keep them well lubricated.

Follow the manufacturer's recommendations on daily lubrication.

## What are some other practices that insure more satisfactory use of the planter?

Transporting the planter. The hydraulic cylinder on trailing planters should be extended or retracted as far as it will go. When moving the planter, the transport link should be connected. On some planters it is advisable to detach the chain drive. The planter will not be as noisy and there will be far less wear on the parts.

Wait until the planter is in the field to fill large fertilizer hoppers and granular pesticide applicators. The dry fertilizer tends to pack so it is recommended that a wrench be used to turn the auger shaft after moving the planter with the hoppers loaded. This takes some of the shock load off the fertilizer drive. Transporting hoppers full of fertilizer has been known to pack it so tightly that the augers have been broken. Keep the hopper and agitator clean and free of caked materials to insure uniform application at the calibrated rate.

When contour planting is not necessary, it is suggested that the field be worked crosswise or on a slight diagonal to the direction of planting so the marker lines can be seen more easily (Fig. 57).

Field conditions. A well prepared seedbed aids in obtaining uniform depth of planting from all seed openers and assists the operator in obtaining straight rows.

Field operation. It is best if the planter wheels follow in the wheel tracks of the tractor, giving the planter greater stability. Do not operate the planter with pressure springs on the fertilizer openers or runner openers compressed tightly.

Do not drive nearer than eight rows of the end before raising the planter. Turn carefully and sharply at the ends of the field to bring the planter in proper location without backing up.

Raise the planter units before backing or the runners or boots will become clogged (Fig. 58).

The runners can be forced out of alignment by turning the planter around in hard ground without raising the planter units (Fig. 59).

Dump the seed hoppers occasionally to eliminate the accumulation of larger kernels.

## What can be done if the planter fails to function properly?

Most planter troubles are caused by im-

Fig. 56. Lubrication Chart

| Location | Number of Fittings or Locations* | Lubricant | | Frequency | |
|---|---|---|---|---|---|
| | | oil | pressure gun grease | twice daily | daily |
| Cylinder anchor bearing | 1 | | ✓ | ✓ | |
| Drill shaft bearings | 6 | | ✓ | | ✓ |
| Row Unit drive shaft bearings (front) | 4 | | ✓ | | ✓ |
| (rear) | 4 | | ✓ | | ✓ |
| Main drive shaft bearings | 3 | | ✓ | | ✓ |
| Wheel frame pivot | 4 | | ✓ | | ✓ |
| Throwout bearing | 1 | | ✓ | | ✓ |
| Ring gear bearings | 4 | | ✓ | | ✓ |
| Press wheel hubs | 4 | | ✓ | | ✓ |
| Drive chain idlers | 2 | | ✓ | | ✓ |
| Disk marker hubs | 2 | | ✓ | | ✓ |
| Marker chain pulleys | 5* | ✓ | | | ✓ |
| Marker trip timing dial | 1* | ✓ | | | ✓ |
| Ratchet pawls | 2* | ✓ | | | ✓ |
| Fertilizer Unit | | | | | |
| Intermediate shaft bearings | 2 | | ✓ | | ✓ |
| Driving sleeve | 1 | | ✓ | | ✓ |
| Drive sprocket | 1 | | ✓ | | ✓ |
| Drive chain idlers | 2 | | ✓ | | ✓ |

Wipe the dirt from fittings before greasing. Apply sufficient lubricant to flush out the old grease and dirt. Wipe off excess grease because this accumulates dirt.

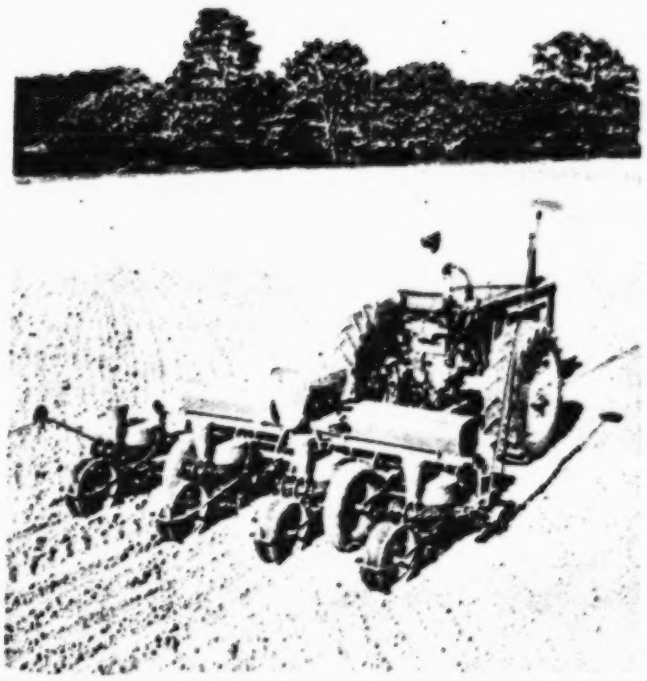

Fig. 57. The marker line shows up more clearly when the final tillage operation was crossways or diagonal to planting.

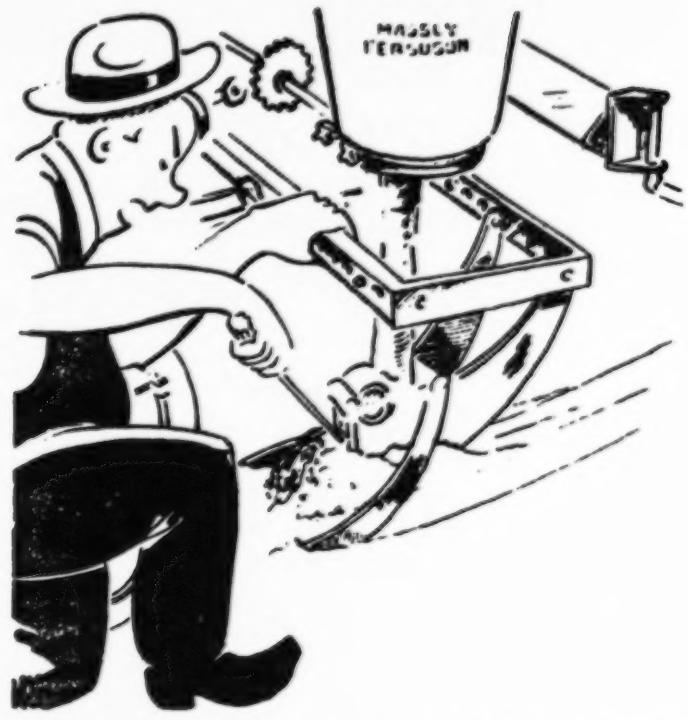


Fig. 58. Never back up with the planter in operating position.

proper adjustment. When you encounter trouble in the field make a systematic check of all planter adjustments. Checking and correcting operating adjustments usually clears up planter troubles.

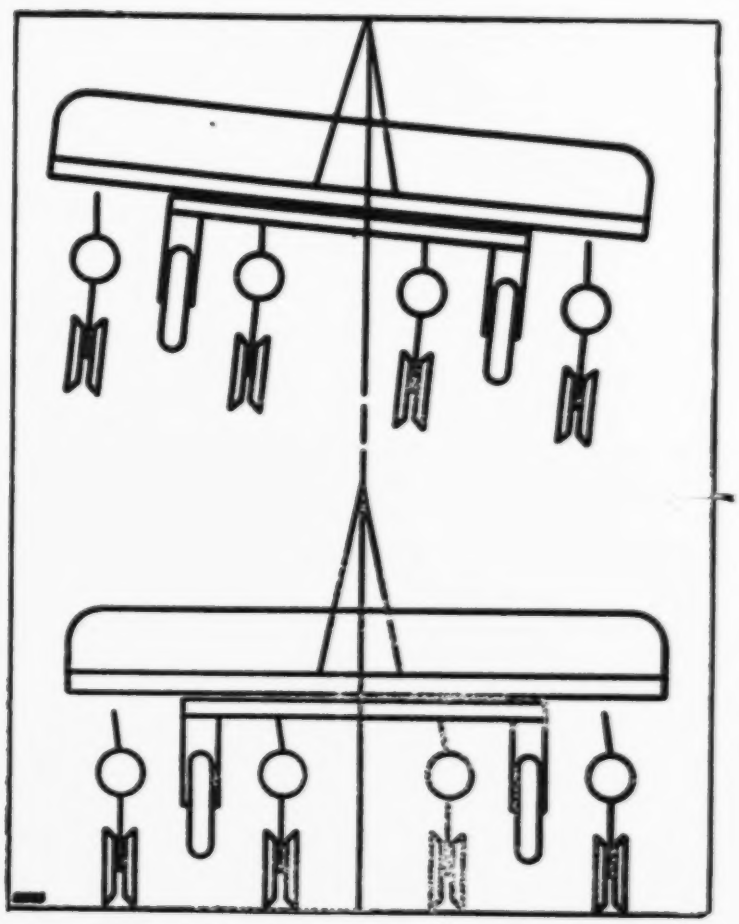

Fig. 59. These illustrations are exaggerated examples of what happens when the runners are out of alignment.

## FURROW OPENERS NOT PENETRATING GROUND

| Possible Causes | Remedy |
|---|---|
| 1. Hard ground | 1. Use pressure spring attachment to increase pressure on runners. |
| 2. Worn out furrow openers | 2. Replace worn out runner openers. Weld additional plate to replace worn portion of opener. |
| 3. Fertilizer openers set too deep | 3. Readjust fertilizer openers. |
| 4. Planter not level | 4. Adjust hitch clevis. |

## SEED OR FERTILIZER NOT PROPERLY COVERED

| Possible Causes | Remedy |
|---|---|
| 1. Soil condition | 1. Use covering blades or covering disks. |
| | 2. Adjust covering blades or disks. |
| | 3. Prepare a better seedbed. |
| | 4. Set planter deeper. |

## SINGLE DISK FERTILIZER OPENER NOT ENTERING GROUND

| Possible Causes | Remedy |
|---|---|
| 1. Depth set deeper than plowing depth | 1. Prepare deeper seedbed. |
| | 2. Adjust opener for shallower depth. |

## SOIL LOOSE AROUND SEED

| Possible Cause | Remedy |
|---|---|
| 1. Cloddy soil condition | 1. Use rubber tires on press wheels. Use seed firming wheels. Prepare seedbed more thoroughly. |
| 2. Insufficient press wheel pressure | 2. Increase pressure on press wheels. |

## MARKERS NOT LATCHING

| Possible Causes | Remedy |
|---|---|
| 1. Chain stretched | 1. Shorten length of chain. |
| 2. Chain too long | 2. Shorten length of chain. |

## INACCURATE SEED DROP

| Possible Causes | Remedy |
|---|---|
| 1. Poorly graded seed corn | 1. Use seed that is graded more uniformly. |
| 2. Planter speed too fast | 2. Use recommended planter speeds. Check seed against seed plate on dealer's seed plate test stand at recommended speed. Reduce planter speed. |
| 3. Wrong seed plates | 3. Use recommended seed plates. Check seed against seed plate on dealer's seed plate test stand. Check planting rate in barn lot. |
| 4. Planter out of time | 4. Check timing of planter (see operator's manual for procedure). |
| 5. Floor plate turned wrong side up | 5. Check floor plate. |
| 6. Wrong false ring used | 6. Use correct false ring. |
| 7. Cut-off pawls or knocker not working | 7. Check for worn cut-off pawl. Check cut-off pawl springs. Check operation of knock-out pawls. Seed may get into housing of knock-out pawl and cut-off pawls. Pawls may be too rusty or too tight. |
| 8. Chain on wrong sprocket or too loose | 8. Check if chain is on correct sprockets. Tighten chain. |
| 9. Weak rockshaft spring | 9. Replace rockshaft spring. |
| 10. Valves out of adjustment | 10. Check valve adjustment. |
| 11. Obstruction in shank | 11. Check shanks for clear operation. |
| 12. No oil or oil too heavy in gear case | 12. Check kind and level of oil in gear case. |
| 13. Check heads and check forks not adjusted properly on check-row planter | 13. Check adjustment |

## SCATTERING OF HILLS IN ROW

| Possible Causes | Remedy |
|---|---|
| 1. Planter out of time | 1. Retime planter (see operator's manual for correct procedure). |
| 2. Clogged boots or runners | 2. Do not back up with furrow openers in ground.<br>Depth of split-row fertilizer boot set too deep. |
| 3. Planting too fast | 3. Use recommended planting speeds. |
| 4. Valve rod out of adjustment | 4. Readjust valve rod. |
| 5. Check shaft spring out of adjustment | 5. Adjust spring to proper tension or replace spring. |
| 6. Check shaft binding | 6. Check for interference of misalignment of check shaft. |
| 7. Worn runner openers | 7. Replace or repair runner openers. |
| 8. Poorly prepared seedbed | 8. Prepare seedbed more thoroughly to eliminate trash, roots, or grassy conditions. |

## MARKER LINE NOT VISIBLE

| Possible Cause | Remedy |
|---|---|
| 1. Marker shoe or disk improperly set | 1. Adjust angle of shoe or disk to drag smoothly on ground.<br>2. Place more weight on marker. |

## PLANTER DRIVE JERKING OR CATCHING

| Possible Cause | Remedy |
|---|---|
| 1. Drive chain too loose | 1. Tighten drive chain |

## PLANTER MISSES SETS OF HILLS

| Possible Causes | Remedy |
|---|---|
| 1. Clutch not engaging properly | 1. Adjust clutch or repair. |
| 2. Roller or clutch stop lever loose or worn | 2. Tighten clutch stop lever. Replace worn clutch stop lever. |
| 3. Clutch dog spring weak or broken | 3. Replace clutch dog spring. |

## PLANTING MORE CORN IN SOME ROWS THAN IN OTHERS

| Possible Causes | Remedy |
|---|---|
| 1. Action of cut-off pawl or knocker | 1. Check for seed in cut-off pawl or knocker housing. Check for weak or broken cut-off spring. Check for worn cut-off pawl. |
| 2. Wrong seed plate | 2. Check for uniformity of seed plates so they are the same in all planting units. Plates and hoppers are not all the same size which gives larger cell sizes in some hoppers. |
| 3. Wrong false ring | 3. Check for uniformity of false rings so they are the same in all planting units. |
| 4. Warped false ring | 4. Check condition of false rings. |
| 5. Hopper not clamped down tight | 5. Be sure all hoppers are clamped down tight. |
| 6. Not enough corn in the hopper | 6. Empty when 2 inches of corn remains in the hopper to remove larger kernels. |

## 5. HOW SHOULD I MAINTAIN THE PLANTER?

Care and maintenance of the corn planter is important for two reasons. (1) The corn planter is used only a few days each year. The performance of the planter during the few hours it is in the field may make the difference between a profit or a loss on the crops it plants. On a farm where the principal crops are row crops, the poor performance of the planter may mean financial ruin. Since its performance is so important, it deserves good care during the rest of the year when it is not in use. (2) Planters are precisely made farm implements and they are expensive. Equipment that represents this large an investment should receive good care. Good care and maintenance will assure efficient and accurate planting at high speeds for many years.

Remember, good care and long service go together. How long your planter will last and continue to do good work depends largely on the maintenance and care given by the operator.

### What preparations should be made for off-season storage?

Store the planter on blocks or jacks. Block up the runners so the weight of the planting units doesn't rest on the zero-pressure press-wheel tires. This will prevent deformity or flat spots caused by the tires being depressed for a long period of time. Store the planter in a shed or cover the entire unit with a tarpaulin.

Replacement Parts. The first step in post-season service and repair is to determine in detail the needed replacement parts, adjustments, and service. These jobs should be marked with tags on the planter or written down in a notebook or on a service inspection sheet (Fig. 60).

Parts that are broken or badly worn may need to be replaced. Refer to the owner's manual and order these parts by the correct part number. Some worn parts can be built

Fig. 60. Planter repair jobs that need to be done before next planting season should be listed so they can be completed when the press of farm work is not so heavy.

up in the shop. Parts that are wearing by soil abrasion may be hard surfaced to prolong their life.

Cleaning and lubrication. Clean the planter to remove grease, dirt, chemicals, etc. This can be done with water pressure. The accumulation of grease may be softened with solvent and removed by putty knife or wire brush.

Grease the polished surface of all ground working parts of the planter (fertilizer opener, runners, marker, etc.).

Lubricate chains with heavy oil or grease.

Fertilizer attachments. The worst enemy of dry fertilizer distribution equipment is corrosion. Empty the hoppers as soon as possible after planting is completed. Wash out the hopper, tube, and opener thoroughly and replace them. Remove the augers and clean them thoroughly. Use a wire brush if necessary to remove any accumulation of fertilizer. Some manufacturers recommend repainting scarred surfaces with an aerosol spray can to prevent corrosion. Protect the parts subject to rusting with oil, grease, paint, or any suitable rust preventive.

As double disk openers wear, the disks of the offset type can be exchanged because the leading disk wears faster.

For liquid fertilizer attachments, open the distributor valve and flush the system well. If the tanks are metal, add a pint of light oil to the final flush. Use compressed air to clean and dry the liquid fertilizer system.

## 6. WHAT ARE SOME PRACTICAL APPLICATIONS?

Fill out this information sheet for your corn planter. Use the operator's manual as a reference.

### CORN PLANTER INFORMATION SHEET

Mfg. Name_____ Model_____ Size_____

In the space below each unit list other information about the unit.

### THE PLANTER

Identify the major parts of the planter

Hitch and Frame
Power Transmission Train
Planter Unit and Gauge Wheel

What row spacings are possible?

Trace power from wheels to all attachments. (sketch if necessary)

List special precautions for transporting.

Describe marker operation.

Check the accessories noted.

___ runner openers
___ disk openers
___ check-row attachment
___ gauge shoes
___ trash kickers
___ multi-luber
___ press wheel scraper
___ press wheel bands
___ rubber press wheel tires
___ covering knives
___ covering disks
___ seed packer wheels
___ minimum tillage attachment
___ dual wheels
___ herbicide attachment
___ insecticide attachment
___ soil incorporating equipment
___ disk marker
___ check-row equipment
___ grass waterway attachment
___ fertilizer attachment
___ other

### PLANTING UNIT

Identify all parts in planting unit and describe their function.

What is maximum and minimum distance between hills? Between kernels when drilling?

What maximum and minimum planting rates are possible? (40 in. rows)

How fast can you drive at different planting rates?

How is hill spacing varied?

How are kernels per hill varied?

How is the planter set for drilling?

How is planter set for hill dropping?

How many hill dropping rates are possible?

How is depth of planting controlled?

How is pressure on press wheel adjusted?

What is the capacity of seed hoppers?

How are the seed plates matched to seed?

## FERTILIZER ATTACHMENT

Identify all parts of fertilizer attachment and describe their function.

What is the capacity of hoppers? Tanks?

How is the fertilizer attachment engaged?

What are minimum and maximum rates per acre? (40 in. rows)

How is fertilizer applicator calibrated?

How is depth of placement adjusted?

Where can fertilizer be placed in relation to the row?

What daily care is needed?

What maintenance is needed?

## INSECTICIDE ATTACHMENT

What care is needed?

What is the range in rate of application per acre?

How is it calibrated?

## HERBICIDE ATTACHMENT

What care is needed?

What is the range in rate of application per acre?

How is it calibrated?

## LUBRICATION

What are the twice daily lubrication requirements?

What are the daily lubrication requirements?

What are the periodical lubrication requirements?

## PRE-SEASON SERVICE CHECK

Is planter lubricated properly?

What tire pressure is recommended?

Are width settings correct? Are markers set to match row widths?

Are seed hoppers and hopper bottoms ready to use?

Does seed fit the seed plates?

Is fertilizer attachment ready for field use?

Are all bolts, nuts, set screws and cotter pins tight?

## END - OF - SEASON STORAGE PREPARATIONS

Check for worn, lost, or damaged parts and replace them.

What service should be given fertilizer attachment?

What service should be given insecticide attachment?

What service should be given hoppers and hopper bottoms? Runners?

What protection should be given soil engaging parts?

How can planter parts be folded for close storage?

Be prepared to complete these Laboratory Exercises or Demonstrations:

1. Change press wheel pressure.
   a. How much increase or decrease in planting depth does this cause?
2. Select correct seed plate to match seed.
3. Set planter to hill drop 2 kernels per hill for approximately 18,500 plants per acre population with 40-inch rows.
   a. What seed plate is used?
   b. What is the recommended planter speed?
   c. What is the hill spacing in the row? If this is changed to approximately 21 inches, will it affect the population? How much?
4. Set planter to hill drop 3 kernels per hill for approximately 19,500 plants per acre with 40-inch rows.
   a. What seed plate is used?
   b. How far apart are the kernels in the row?
5. Set planter to hill drop 4 kernels per hill for approximately 23,000 plants per acre.
   a. What sprockets are used on the drill shaft and counter shaft?
   b. What change would be made if the sprocket on the drill shaft were changed to a 12-tooth sprocket?
6. Set planter to drill corn 6 inches apart in the row using the 16-cell seed plate, then the 24-cell seed plate.
   a. What plant population will each setting give?
7. Set planter to plant 45, 46, 47, or 48 pounds of soybeans per acre.
8. Show how to change row spacings.
   a. What different row spacings can be set on this planter?
9. Demonstrate how to clean and service fertilizer attachment.
   a. What daily service is recommended?
   b. What prestorage service is recommended?
10. Calibrate fertilizer attachment.
    a. What are maximum and minimum rates that can be applied?

(Laboratory calibration) With fertilizer in hopper, and planter on supports, place container under the discharge opening and turn wheels 10 revolutions. Measure circumference of tire and calculate distance traveled. Multiply distance by the width of row. Divide this by 43,560. This gives the fraction of an acre covered. Weigh the fertilizer and divide by the fraction of an acre covered. The result will be the amount applied per acre.

(Outdoor calibration) Remove one delivery tube and tie a bag to the spout under the hopper. Engage the fertilizer attachment and drive forward 13 ft. after fertilizer starts flowing. Weigh the amount of fertilizer caught and multiply this by 100. The result will be the pounds of fertilizer delivered per acre when planting 40-inch rows.

11. Demonstrate how moist or lumpy fertilizer causes irregular flow.
12. Demonstrate how restricted fertilizer boot openings affect rate of application.
13. Demonstrate how gravity flow liquid fertilizer application rate is affected by forward speed.
14. Calibrate granular herbicide and insecticide attachments.
    a. This should be done for the rate (number of lbs. per acre) at the normal planting speed. Attach a cloth bag over the diffuser, lower the planter and drive a complete row at planting speed. Weigh the herbicide caught in the cloth bag and calculate the rate per acre. Make necessary adjustments and recheck. This calibration should be done for each unit.
15. Calibrate liquid insecticide or herbicide attachments.
    a. This should be done for the rate (gallons per acre) at the normal speed or rpm at which planting is done.
16. Demonstrate correct planter lubrication.
    a. What parts require lubrication twice daily?
    b. What parts require daily lubrication?
17. Time the planter.
18. Disassemble unit to inspect the valves.
19. Examine the runner.
    a. Identify and explain the function of all parts.
    b. Does runner opener need to be rebuilt.
20. Examine sprockets, chains, and gears.
    a. Are any parts worn so badly they affect timing?
21. Examine planter for lost, worn, or broken parts.
    a. What is correct replacement part number for this model planter? (Use operator's manual to identify missing part)
22. Examine seed hopper, hopper bottom, and seed plates.
    a. Are hopper bottom plates worn?
    b. Are cut-off pawls worn? Is movement free?
    c. Do the knock-out pawls need adjusting?
23. Outline pre-storage service procedure for the end of the season.
24. Outline pre-season checks and service before starting to plant.

The illustrations used in this unit were provided by Allis Chalmers Mfg. Co., Milwaukee, Wisconsin; Deere & Company, Moline, Illinois; Gandy Company, Owatonna, Minn.; International Harvester Co., Chicago, Illinois; and Massey Ferguson Inc., Detroit, Michigan.

Fill out this information sheet for your planter. Use the operator's manual as a reference.

## CORN PLANTER INFORMATION SHEET

Mfg. Name_____ Model_____ Size_____

In the space below each unit list other information about the unit.

### THE PLANTER

Identify the major parts of the planter

- Hitch and Frame
- Power Transmission Train
- Planter Unit and Gauge Wheel

What row spacings are possible?

Trace power from wheels to all attachments. (sketch if necessary)

List special precautions for transporting.

Describe marker operation.

Check the accessories noted.

___ runner openers
___ disk openers
___ check-row attachment
___ gauge shoes
___ trash kickers
___ multi-luber
___ press wheel scraper
___ press wheel bands
___ rubber press wheel tires
___ covering knives
___ covering disks
___ seed packer wheels
___ minimum tillage attachment
___ dual wheels
___ herbicide attachment
___ insecticide attachment
___ soil incorporating equipment
___ disk marker
___ check-row equipment
___ grass waterway attachment
___ fertilizer attachment
___ other

### PLANTING UNIT

Identify all parts in planting unit and describe their function.

What is maximum and minimum distance between hills? Between kernels when drilling?

What maximum and minimum planting rates are possible? (40 in. rows)

How fast can you drive at different planting rates?

How is hill spacing varied?

How are kernels per hill varied?

How is the planter set for drilling?

How is planter set for hill dropping?

How many hill dropping rates are possible?

How is depth of planting controlled?

How is pressure on press wheel adjusted?

What is the capacity of seed hoppers?

How are the seed plates matched to seed?



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FERTILIZER ATTACHMENT

Identify all parts of fertilizer attachment and describe their function.

What is the capacity of hoppers? Tanks?

How is the fertilizer attachment engaged?

What are minimum and maximum rates per acre? (40 in. rows)

How is fertilizer applicator calibrated?

How is depth of placement adjusted?

Where can fertilizer be placed in relation to the row?

What daily care is needed?

What maintenance is needed?

INSECTICIDE ATTACHMENT

What care is needed?

What is the range in rate of application per acre?

How is it calibrated?

HERBICIDE ATTACHMENT

What care is needed?

What is the range in rate of application per acre?

How is it calibrated?

LUBRICATION

What are the twice daily lubrication requirements?

What are the daily lubrication requirements?

What are the periodical lubrication requirements?

PRE-SEASON SERVICE CHECK

Is planter lubricated properly?

What tire pressure is recommended?

Are width settings correct? Are markers set to match row widths?

Are seed hoppers and hopper bottoms ready to use?

Does seed fit the seed plates?

Is fertilizer attachment ready for field use?

Are all bolts, nuts, set screws and cotter pins tight?

END - OF - SEASON STORAGE PREPARATIONS

Check for worn, lost, or damaged parts and replace them.

What service should be given fertilizer attachment?

What service should be given insecticide attachment?

What service should be given hoppers and hopper bottoms? Runners?

What protection should be given soil engaging parts?

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